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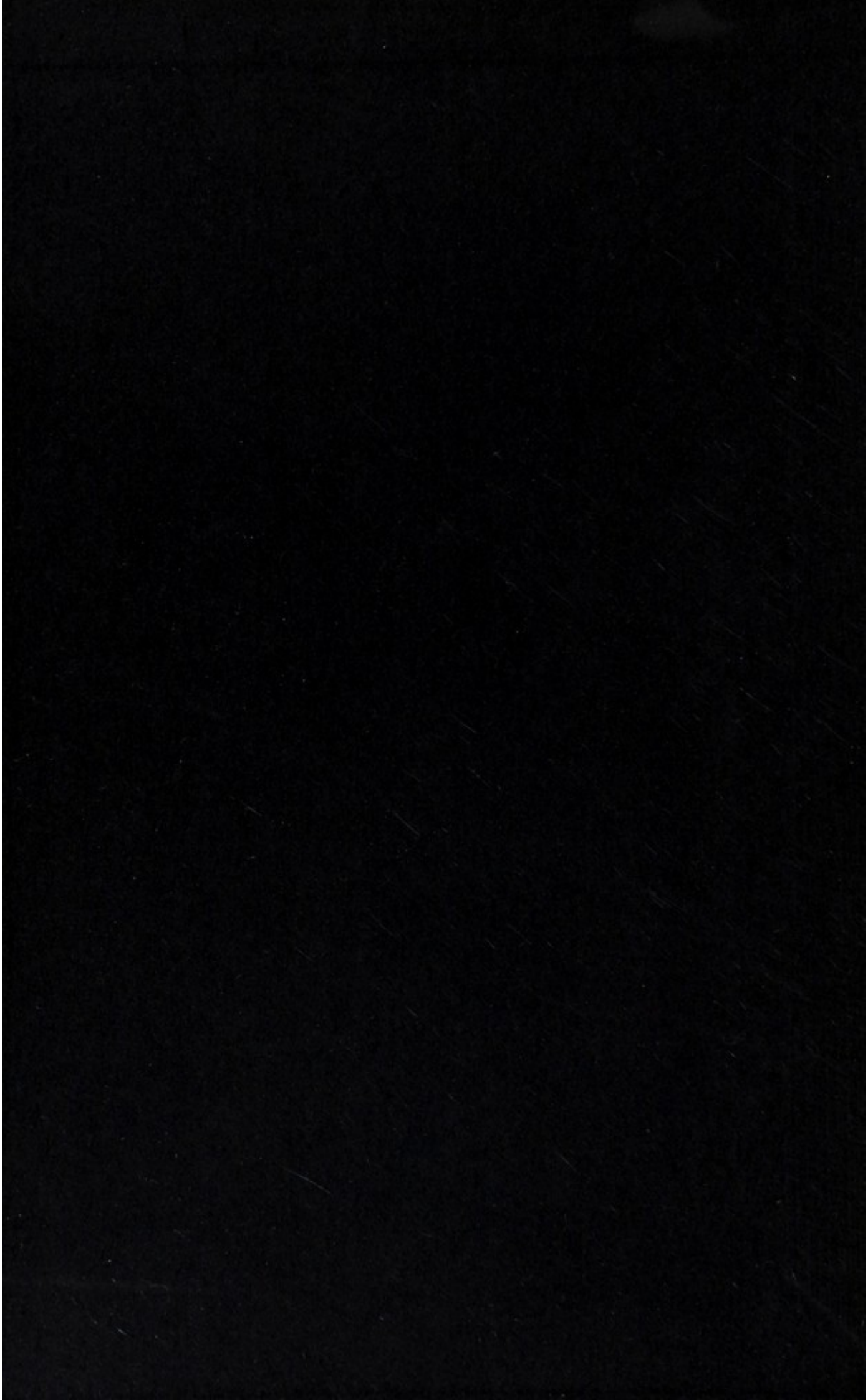

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A HANDBOOK
OF
MIDWIFERY

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A LOBE OF THE PLACENTA OF THE CALF, SHOWING NON-DECIDUATE MATERNAL PORTION.

St. George's Hospital Museum.

A HANDBOOK

OF

MIDWIFERY

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BY

W. R. DAKIN, M.D., B.S.(LOND.), F.R.C.P.

OBSTETRIC PHYSICIAN AND LECTURER ON MIDWIFERY AND DISEASES OF WOMEN TO ST GEORGE'S HOSPITAL: PHYSICIAN TO THE GENERAL LYING-IN HOSPITAL. LATE EXAMINER IN MIDWIFERY AND DISEASES OF WOMEN ON THE CONJOINT BOARD OF THE ROYAL COLLEGES OF PHYSICIANS AND SURGEONS IN ENGLAND

WITH 400 ILLUSTRATIONS

(NEARLY ALL OF WHICH ARE ORIGINAL)

LONGMANS, GREEN, AND CO.
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PREFACE

THIS work is intended for students and junior practitioners. The subject is arranged in two divisions, those of Physiology and Pathology. In each of these the events of Pregnancy, Labour, the Puerperal Period, and those connected with recent birth are dealt with in turn.

I have endeavoured to omit nothing that has a practical bearing, and at the same time to avoid the waste of space and the confusion of the reader's mind which would be incurred by inserting all the most recent pathological speculations and the newest details of treatment. With this object it has been my care to read through, or at least examine, all available treatises and monographs dealing with each portion of the subject, to allow the facts, if any appeared, to undergo mental digestion, and then to write the paragraph or chapter dealing with the particular question.

The main part of the matter contained and the opinions expressed in the text is, however, derived from the experience I have gained from my own cases, principally in hospital, and from the cases of others either seen by me or described by observers worthy of confidence.

I have made all the diagrams to illustrate the text, and not to represent objects or events, drawing them for the most part at the time of writing. I have thus introduced no unnecessary details. In the very few instances where a detailed representation of any object seemed desirable, I have had it photographed, or have borrowed or copied a reliable block already published. There is no doubt that students are better treated if they are obliged to examine things (even museum specimens) than when they are shown pictures of them, and that they can learn very little of an obstetrical operation from photographs of the scene, in which the paper is mostly covered with irrelevant detail.

To the necessarily intermittent method in which literary work must be done by a medical man in practice I may be allowed to ascribe at least two omissions. They are an account of Thrombus Vaginæ and a description of the attitude known as Walcher's Position. These omissions are supplied in an Appendix.

I have taken especial pains with the index, believing this to be a most essential part of a text-book.

My thanks are due to many friends (mostly for references to recorded cases), and among them to Dr. EDEN for the use of some of his micro-photographs of the placenta. Especially I must thank Dr. PROBYN-WILLIAMS, formerly House Physician to the General Lying-in Hospital, for his generous help during transcription and in the preparation of the index.

Erratum

In description of figs. 94 and 96, *for* Fig. 97 *read* Fig. 95

CONTENTS

PHYSIOLOGY

Physiology of Pregnancy

CHAPTER		PAGE
I.	Development of decidua and ovum	1
II.	Placenta and membranes at term	15
III.	The ovum at different periods of pregnancy	29
IV.	Attitudes and mechanical relations of the fœtus in utero	32
V.	Changes in the maternal organism	35
VI.	Diagnosis of pregnancy	58
VII.	Diagnosis of pregnancy—*continued*	65
VIII.	Multiple pregnancy	72
IX.	Hygiene of pregnancy	76

Physiology of Labour

X.	Definition of labour	78
XI.	Anatomy of fœtus	90
XII.	Action of the expelling force	95
XIII.	Action of pains on the uterus and its contents	102
XIV.	Progress of labour	109
XV.	Progress of labour—*continued*	120
XVI.	General mechanism of labour in vertex positions	128
XVII.	Special mechanism of labour in vertex positions	141
XVIII.	Diagnosis of lies and positions	149
XIX.	Face presentations	153
XX.	Brow presentations	165
XXI.	Podalic lies	168

Management of Labour

XXII.	General principles of management	180
XXIII.	Management of the first stage of labour	186
XXIV.	Management of the second and third stages of labour	190
XXV.	Details of management of labour in special lies and presentations	197
XXVI.	Labour in multiple pregnancy	203
XXVII.	Anæsthetics	205

Physiology of the Puerperal Period

CHAPTER		PAGE
XXVIII.	Uterus and other pelvic organs after labour	208
XXIX.	Involution	213
XXX.	Lochia, afterpains, lactation	216
XXXI.	Changes in the general system	219
XXXII.	Diagnosis of the puerperal state	223
XXXIII.	Management of puerperal state	225

The New-born Child

XXXIV.	Physiology and management	235

PATHOLOGY

Pathology of Pregnancy

XXXV.	Pathology of pregnancy	246
XXXVI.	Affections of the chorion	252
XXXVII.	Affections of the amnion	257
XXXVIII.	Diseases of the placenta and cord	260
XXXIX.	Intra-uterine diseases and death of fœtus	263
XL.	Affections of the maternal organism directly connected with pregnancy	271
XLI.	Affections directly connected with pregnancy—*continued*	280
XLII.	Accidental complications of pregnancy	287
XLIII.	Accidental complications of pregnancy—*continued*	296
XLIV.	Abortion and premature labour	303
XLV.	Ectopic gestation	315
XLVI.	Hæmorrhages during pregnancy	333

Obstetric Operations

XLVII.	General considerations	352
XLVIII.	Obstetric operations—*continued*	362
XLIX.	Obstetric operations—*continued*	365
L.	Obstetric operations—*continued*	371
LI.	Obstetric operations—*continued*	386
LII.	Cæsarian section, treatment of ruptured uterus, and Porro's operation	394
LIII.	Symphysiotomy	402

Pathology of Labour

LIV.	Precipitate and prolonged labour	406
LV.	Abnormalities in the expelling force	410
LVI.	Abnormalities in the passage	415
LVII.	Development of the adult pelvis	421
LVIII.	Varieties of deformed pelvis	424
LIX.	Modifications of the mechanism of labour in the commoner varieties of contracted pelvis	432
LX.	Treatment of the common forms of contracted pelvis	438
LXI.	The rarer kinds of deformed pelvis	443
LXII.	Abnormalities in the passage—*continued*	454
LXIII.	Abnormalities in the ovum affecting labour	461

CHAPTER		PAGE
LXIV.	Retention of placenta—Post-partum hæmorrhage—Inversion of the uterus	478
LXV.	Lacerations of the genital tract	489
LXVI.	Cardiac and pulmonary diseases, albuminuria and eclampsia	503
LXVII.	Accidental complications of labour affecting the life of the child only	514

PATHOLOGY OF THE PUERPERAL PERIOD

LXVIII.	Fevers	525
LXIX.	Local specific inflammations	541
LXX.	General specific fevers	544
LXXI.	Diseases of special systems: vascular system	548
LXXII.	Diseases of the vascular system—*continued*	553
LXXIII.	Disorders of the nervous system	556
LXXIV.	Diseases of special systems—*continued*: Urinary system	566
LXXV.	Affections of breasts and nipples	569
LXXVI.	Abnormalities of the lochia: Deciduoma malignum	576

PATHOLOGY OF THE NEW-BORN CHILD

LXXVII.	Pathology of the new-born child	579

APPENDIX A.	Thrombus vaginæ, hæmatoma of vulva	587
APPENDIX B.	Walcher's position	588

INDEX OF AUTHORS		589
INDEX OF SUBJECTS		591

LIST OF ILLUSTRATIONS

FIG.		PAGE
	Lobe of placenta of calf	*Frontispiece*
1.	Diagram of Graafian follicle	2
2.	To show relation of infundibulum to ovary	2
3.	Ovary a few hours after rupture of a follicle	3
4.	Corpus luteum (18th day)	3
5.	Corpus luteum at the 6th month of pregnancy	3
6.	Cicatrix of corpus luteum (1 month after delivery)	3
7.	Stages of corpus luteum	4
8.	Diagrammatic section of the uterine mucous membrane	5
9.	Stages in the inclusion of the ovum in the decidua	5
10.	Diagram of decidua	6
11.	Section of decidua vera in situ	6
12.	Uterine wall and membranes at edge of placental site	7
13.	Developing ovum	8
14.	Developing ovum	8
15.	Developing ovum	8
16.	Formation of allantois	9
17.	Formation of allantois	9
18.	Developing ovum	9
19.	Developing ovum	10
20.	Developing ovum	10
21.	Diagrammatic section through placenta near centre	11
22.	Section through a normal placenta of seven months in situ	12
23.	Section illustrating the structure of the placenta	13
24.	Transverse section of a villus from a placenta of seven months	14
25.	Portion of an injected villus from a placenta of about five months	14
26.	Curling artery	14
27.	Falciform 'valve'	14
28.	Section through edge of placenta	16
29.	Small portion of a four months' placenta	17
30.	Section of membranes	18
31.	A child a few hours old	20
32.	Transverse section of umbilical cord	21
33.	Umbilical artery in fig. 32	21
34.	Section through wall of umbilical vein	22
35.	Placenta succenturiata	23
36.	Placenta with 'collerette'	24
37.	Section through amnionic fold at edge of placenta of fig. 36	24
38.	Placenta, bilobed, with errant vessel	25

FIG. PAGE

39.—Dilated artery just by insertion of cord 25
40.—Fibrous masses 25
41.—Artery of a villus in an early stage of endarteritis 26
41A.—Section through the edge of an infarct 27
42.—Central insertion 28
43.—Lateral insertion 28
44.—Marginal insertion 28
45.—Velamentous insertion 28
46.—Ovum of about the fifth week 29
46A.—Ovum of seven to eight weeks 30
47.—Diagram of uterus at three to four months 31
48.—Uterus at term 33
49.—Shape of uterus at different months of pregnancy 37
50.—Horizontal section of spinal column and uterus 37
51.—(*a*) Uterus relaxed ; (*b*) uterus contracted 38
52.—Shape of abdomen in case of arcuate uterus 38
53.—Section of pelvis about third month 39
54.—Opened abdomen of a woman three and a half months pregnant . . . 39
55.—Diagram showing relations of uterus when relaxed, as in fig. 54, and when contracted 40
56.—Uterus at six months 40
57.—Diagram showing increase in size of muscle-cells 41
58.—Part of a placental sinus ¦. 43
59.—Thrombosis of a spiral artery, immediately beneath the placenta . . . 44
60.—Apparent shortening of cervix in pregnancy 45
61.—Apparent shortening from bulging of anterior uterine wall 45
62.—Varicose veins below urethra 47
63.—Relation of ovary and broad ligament at term 48
64.—Right obliquity and dextro-rotation of uterus 48
65.—Section through pelvis (vertical) 49
66.—Bladder during pregnancy (one form) 50
67.—A primigravida at term 51
68.—From the same case as fig. 67 52
69.—Colostrum stage 53
70.—Section through edge of old stria from abdomen 53
71.—Areola and secondary areola in a brunette at term 54
71A.—Areola and secondary areola in a blonde 55
72.—Method of obtaining Ballottement 64
73.—Callipers in position 66
74.—Hymen of virgin 67
75.—Hymen after connection 67
76.—Hymen after parturition 67
77.—Pelvic floor, nulliparous 68
78.—Pelvic floor, parous 68
79.—Twins : 1 73
80.—Twins : 2 73
81.—Twins : 3 73
82.—Scheme of arterial circulation in the cords and placenta in the formation of an acardiac fœtus 74
83.—Acardiac fœtus 75
84.—The two ovoids of the fœtus 78
85.—Fœtus in plan 79
86.—Diagram of parturient canal, coronal section 80
87.—Diagram of parturient canal, sagittal, showing axis 81
88.—Brim of pelvis 81
89.—Outlet 81

FIG. PAGE
90.—Internal surface of pelvis 82
91.—Brim 84
92.—Cavity 84
93.—Outlet 84
94.—Pelvic floor (distended) from the side 87
95.—Direction of groups of fibres of levator ani 87
96.—Pelvic floor (distended) from the front 88
97.—Pelvic floor from above (part of pubic bones removed) 88
98.—Fascia of pelvic floor 89
99.—Attitude of flexion 90
100.—Attitude of extension 90
101.—Fœtal measurements 91
102.—Dorso-sternal diameter 91
103.—Sagittal section through skull 92
104.—Coronal section of skull through parietal tuberosities 92
105.—Method of overlapping of bones of vault 92
106.—Fœtal skull 93
107.—Fœtal skull from above 94
108.—Diagram of pains in the course of labour 96
109.—Relaxed ; and contracted or retracted fibre 97
110.—Upper and lower uterine segments after a few hours' labour after evacuation of liquor amnii 99
111.—Expelling forces and resistances 101
112.—General intra-uterine pressure during a pain—membranes intact . . . 102
113.—Direct uterine pressure 104
114.—Direct uterine pressure 104
115.—Effect of bulging membranes 105
116.—Effect of a pain on maternal and fœtal pulses respectively 107
117.—Uterus relaxed 111
118.—Uterus contracting 111
119.—Primipara, dilation of cervix 112
120.—Primipara, dilation of cervix 112
121.—Primipara, dilation of cervix 112
122.—Multipara, dilation of cervix 112
123.—Multipara, dilation of cervix 112
124.—In multipara or primipara, dilation of cervix 113
125.—In multipara or primipara, dilation of cervix 113
126.—Rupture of membranes 113
127.—Formation of a second bag of waters 114
128.—Formation of a second bag of waters 114
129.—First stage of labour 116
130.—Second stage of labour 117
131.—Showing changes in position during labour of floor of pelvis and pelvic viscera 118
132.—Opposition of voluntary and involuntary muscles in labour 120
133.—Uterus in third stage 121
134.—Separation of placenta 122
135.—Separation of placenta 122
136.—Expulsion of placenta (Schultze) 122
137.—Detachment of placenta 123
138.—Transverse section of uterus 124
139.—Expulsion of placenta 125
140.—Shape of placenta during expulsion 126
141.—Uterus just after end of third stage 126
142.—Flexion, vertex presentation 129
143.—Extension, face presentation 129

FIG. PAGE
144.—Attitude between flexion and extension, brow presentation 129
145.—Relation of head to brim (horizontal line) in a primipara 129
146.—Pelvic brim from above 130
147.—Representing the pelvis on its side in the left lateral position and seen from below 131
148.—Differing inclinations of anterior and posterior planes of head 132
149.—Effect of inward pressure of walls of birth-canal on moderately flexed head . 132
150.—Diagram of forces causing flexion 132
151.—Effect of obliquity of uterine axis on head at brim 133
152 —Fœtal axis-pressure on slightly flexed head 133
153.—Effect of fœtal axis-pressure, fully flexed head 133
154.—Relation of head to finger when occiput lies to the left 134
155.—Internal rotation 135
156.—Occiput passing under pubic arch 136
157.—Process of extension 137
158.—Continuation of extension : birth of head 137
159.—External rotation 138
160.—Relations of child to pelvis during delivery of shoulders 138
161.—Mechanism of labour in first vertex 139
162.—Graphic representation of parts felt on abdominal palpation in the case of cephalic lie 141
163.—First vertex 142
164.—Second vertex 142
165.—Third vertex 143
166.—Fourth vertex 143
167.—Moulding in first vertex position 144
168.—Moulding in second position of vertex 144
169.—Convexity of promontory causing extension 145
170.—Persistent occipito-posterior, ordinary mechanism 146
171.—Persistent occipito-posterior, ordinary mechanism 146
172.—Persistent occipito-posterior, ordinary mechanism 147
173.—Rarer form of mechanism in persistent occipito-posterior cases 147
174.—Moulding of head in rarer form of persistent occipito-posterior mechanism . 148
175.—Moulding of head in same case as fig. 174 (seen from above) 149
176.—Graphic representation of parts felt on abdominal palpation in a case of cephalic lie 150
177.—Graphic representation of parts felt on abdominal palpation in a case of podalic lie 151
178.—Abdominal palpation in transverse lie 152
179.—Relation of head to trunk in face presentation 154
180.—Effect of obliquity of fœtal axis-pressure on head at brim 154
181.—Effect of fœtal axis-pressure on a partly extended head 154
182.—Effect of cordate uterus on fœtal axis-pressure 155
183.—Elliptic pelvis 155
184.—Differing inclinations of mental and frontal planes in face presentations . . 156
185.—Effect of inward pressure of walls of birth-canal on head in face presentations 156
186.—First face presentation 157
187.—Mechanism in first face presentation 158
188.—Mechanism in first face presentation 158
189.—Face presentation after rotation of chin forward 159
190.—Face escaping from vulva 159
191.—Face presentation. Birth of head 160
192.—Second face presentation 160
193.—Third face presentation 161
194.—Mechanism in third position of the face 161
195.—Fourth face presentation 162

FIG. PAGE
196.—Diagram of elastic rod 163
197.—Persistent mento-posterior mechanism 164
198.—Persistent mento-posterior mechanism 164
199.—Persistent mento-posterior mechanism 164
200.—Action of fœtal axis-pressure on head between flexion and extension . . . 165
201.—Diagrams of cephalic lie in all attitudes 166
202.—Relation of head to brim in brow presentation 166
203.—Brow presentation from below 166
204.—Relations of head and pelvis in brow mechanisms 167
205.—Siège décomplété, mode des fesses 168
206.—Relation of hydrocephalic fœtus to uterus 169
207.—Graphic representation of what is felt on abdominal palpation in the podalic lie . 170
208.—First position of breech 170
209.—Mechanism in breech presentation 171
210.—Mechanism in breech presentation 171
211.—Mechanism in breech presentation. Birth of buttocks 171
212.—Mechanism in breech presentation 172
213.—Birth of shoulders 172
214.—Birth of head 173
215.—Second position of breech from below 173
216.—Third position of breech 174
217.—Fourth position of breech 175
218.—Delivery of head, occipital posterior (1) 175
219.—Delivery of head, occipital posterior (2) 175
220.—Head-moulding in a breech case 177
221.—Correct moment for extension of head 191
222.—Incorrect moment for extension of head 191
223.—Child in second position of vertex 197
224.—Mechanics of delivery in head-last cases 201
225.—Height of fundus on first day of puerperium 208
226.—Height of fundus at about end of first week 209
227.—Height of fundus (at brim) at end of second week 209
228.—Uterus and pelvic organs after labour 210
228A.—Section of uterus shortly after labour 211
229.—Acini in the colostrum stage 218
230.—Acini in the milk stage 218
231.—Typical average chart of normal puerperium 221
232.—Outlines of moulds of the uterine cavity in different states 225
233.—Budin's catheter 228
234.—Fœtal circulation 236
235.—Scheme of right side of heart 236
236.—Stomach of a newly born infant 238
237.—Diagrammatic section of a carneous mole 248
238.—A carneous mole, opened 249
239.—Villi cut in various planes 250
240.—Groups of villi from a vesicular mole 253
241.—Diagram of affected villus 254
242.—Amnionic adhesions 259
243.—Amnionic adhesions compressing umbilical cord 259
244.—Anencephalus 264
245.—Anencephalus 264
246.—Rudimentary development of left arm, forearm, and hand 267
247.—Pendulous belly 272
248.—Pendulous belly, showing direction of the pull of the abdominal belt . . . 272
249.—Retroverted gravid uterus, showing distended bladder 273
250.—Pelvic hæmatocele 276

FIG. PAGE
251.—Effect of gravity on the retroverted uterus in the knee-elbow posture . . 277
252.—Retroflexed gravid uterus 278
253.—Fibroid complicating pregnancy. Uterus relaxed 289
254.—Fibroid complicating pregnancy Uterus contracting 289
255.—Uterus arcuatus 293
256.—Effect of cordate uterus on fœtal axis-pressure 293
257.—Same uterus tending to produce a face presentation 293
258.—Uterus septus 294
259.—Uterus bicornutus 294
260.—Uterus didelphys 294
261.—Pregnancy in a rudimentary horn of the uterus 295
262.—The same uterus as fig. 261, unimpregnated 295
263.—Complete absence of one horn 295
264.—Section of a retained piece of placenta 307
265.—Section of a retained piece of placenta 308
266.—Sites which ovum is capable of occupying 314
267.—Uterus (enlarged, with decidua) and a gravid tube, the left 316
268.—Rupture of the tube into the peritoneal cavity 317
269.—Rupture of the tube into the broad ligament 318
270.—Ectopic gestation 318
271.—Ectopic gestation 319
272.—Sac and placenta in intra-ligamentous gestation (sub-peritoneo-abdominal) . 319
273.—Fœtal bones in a sac formed by adherent intestines 321
274.—Pregnancy in a rudimentary horn of the uterus 323
275.—Relations of sac to round ligament in tubal gestation 323
276.—Parametritis 329
277.—Accidental hæmorrhage 337
278.—Placenta prævia, central 341
279.—Placenta prævia, lateral 341
280.—Placenta prævia, marginal 342
281.—Placenta prævia 342
282.—Detachment of placenta prævia 343
283.—Diagram of uterine walls 343
284.—Placenta prævia entirely detached from one side of lower segment, and allowing its membranes to bulge 344
285.—De Ribes' bag applied to placenta prævia 348
286.—Wedge formed by child in half-breech attitude 350
287.—Laminaria tent 356
288.—One of a set of Hegar's dilators 357
289.—Hydrostatic dilators modified from Barnes's original pattern 358
290.—Champetier de Ribes' bag 358
291.—Forceps for de Ribes' bag 359
292.—Infusion of saline fluid 361
293.—Canula and ligatures in position 362
294.—Bipolar version 367
294A.—Bipolar version 367
294B.—Bipolar version 367
295.—Bipolar version 368
296.—Chamberlen's forceps 371
297.—Simpson's long curved forceps 372
298.—Showing disadvantage of long straight forceps in application 373
299.—Showing advantage of curve in application of long forceps 373
300.—Assalini's forceps 374
301.—Combination of patterns of Simpson and Barnes 375
302.—Axis-traction forceps 375
303.—Axis-traction by rods 376

FIG. PAGE
304.—Galabin's axis-traction forceps 376
305.—Axis-traction by perineal curve in the shank 376
306.—Introduction of lower blade 378
307.—Introduction of lower blade 379
308.—Introduction of lower blade 379
309.—Introduction of lower blade 379
310.—Introduction of lower blade 379
311.—Introduction of lower blade 379
312.—Introduction of upper blade 380
313.—Introduction of upper blade 380
314.—Introduction of upper blade 381
315.—Introduction of upper blade 381
316.—Application of upper blade 381
317.—Action of left hand in producing axis-traction 382
318.—Extraction over perinæum 383
319.—Showing mechanical advantage of oscillation 384
320.—Ideal application of forceps 385
321.—Usual relation of forceps to head 385
322.—Oldham's perforator, blades separated 387
323.—Hicks's cephalotribe 388
324.—Barnes's craniotomy forceps 390
325.—Oldham's vertebral hook 391
326.—Normal abdomen, incision for Cæsarean section 396
327.—Pendulous belly, incision for Cæsarean section 396
328.—Incision, edges grasped by assistant's hands 397
329.—Position of deep sutures 398
330.—Arrangement of drainage-tube 400
331.—Much thinned lower segment in a case of contracted brim 409
332.—Method of measuring the diagonal conjugate in the normal dried pelvis . . 417
333.—Method of measuring the diagonal conjugate in a case with contracted brim . 418
334.—Varieties of symphysis 419
335.—Development of pelvis (sacrum) 422
336.—Development of pelvis (sacrum) 422
337.—Development of pelvis (infantile shape) 423
338.—Development of pelvis (adult shape) 423
339.—Flat generally contracted pelvis 429
340.—Vault of skull moulded by pelvis in last figure 430
341.—Side view of same skull as fig. 340 430
342.—Abnormal height of uterus post-partum caused by contracted brim . . . 431
343.—Diagram showing advantage of Nägele obliquity 433
344.—Production of Nägele obliquity 434
345.—Relation of head to brim in pendulous belly 434
346.—Elliptic brim 435
347.—Reniform brim 435
348.—Measurement of fœtus in utero by callipers 439
349.—Development of skoliotic pelvis 444
350.—Skoliotic pelvis 444
351.—Caries of left sacro-iliac joint 445
352.—Nägele pelvis (early stage) 446
353.—Nägele pelvis (fully developed) 446
354.—Kyphotic pelvis 447
355.—Malacosteon pelvis, seen from above 450
356.—Malacosteon pelvis, from the front 450
357.—Malacosteon pelvis, from the side and slightly above 451
358.—Spondylolisthetic pelvis 453
359.—Back view of a woman with spondylolisthesis 453

FIG. PAGE
360.—Congenital hypertrophic elongation of cervix 456
361.—Bisacromial diameter freed by traction applied to anterior axilla 462
362.—Hydrocephalic fœtus in utero 464
363.—Elevation of brim and child in transverse lie 467
364.—Plan of brim and child in transverse lie 467
365.—Diagram of transverse lie 468
366.—Spontaneous version 469
367.—Spontaneous version 469
368.—Spontaneous version 469
369.—Spontaneous evolution 470
370.—Spontaneous evolution 470
371.—Spontaneous expulsion 471
372.—Graphic representation of parts which may be felt in a transverse lie . . . 472
373.—Impaction of breech 474
374.—Prolapse of feet with head 476
375.—Bimanual compression of uterus 484
376.—Inversion of uterus 486
377.—Complete inversion, showing relation of ovaries and tubes 486
378.—Laceration of vagina, cervix, and lower uterine segment into the right broad ligament and abdominal cavity 490
379.—Laceration of perinæum 497
380.—Suture of incomplete perinæal rupture 499
381.—Method of inserting sutures in complete rupture 500
382.—Reposition of prolapsed cord by tape and catheter 517
383.—Isolation of umbilical vessels by finger and thumb 518
384.—Case of puerperal septicæmia ending in death 529
385.—Diagram of parametritis 532
386.—Remote parametritis 533
387.—Mild case of parametritis (chart) 536
388.—Rise of temperature due to emotion (chart) 562
389.—Rise of temperature in hysteria (chart) 562
390.—Lumbo-sacral cord crossing the brim 563
391.—Rise of temperature accompanying constipation (chart) 569
392.—Paralysis of left side of face 579
393.—Isolation of umbilical vessels by finger and thumb 585

PREGNANCY

PHYSIOLOGY OF PREGNANCY

THIS subject is divided into two sections. The first section deals with the development of the fœtus and its appendages, and then with its appearance and characters at term. The account of development is limited to a short description of the growth of the amnion, chorion, and decidua, and the formation of the placenta and umbilical cord. The size and external appearances of the ovum and fœtus at certain stages of pregnancy are mentioned, and the characters special to each of these periods of pregnancy indicated.

The description of the child at term applies mainly to the points indicating maturity. Its anatomy, as bearing on obstetrics, is described under 'Labour.'

The second section includes a description of the changes in the maternal system which accompany pregnancy; and a consideration of the diagnosis of pregnancy, and the management of the woman during the nine months occupied in the growth of the ovum.

CHAPTER I

DEVELOPMENT OF DECIDUA AND OVUM

The Graafian Follicle.—The mature Graafian follicle is found at the surface of one of the ovaries, partly projecting in the form of a translucent elevation, but having its larger portion imbedded in the substance of the ovary. This little vesicle has a diameter of about one-third of an inch.

Each follicle contains an ovum, and there are computed to be in the ovaries of a child follicles to the number of five or six hundred thousand. Of these not more than about four hundred could under any circumstances have a chance of maturing, supposing one came to the surface and ruptured once every month for thirty years or so. It is believed that a follicle does mature and burst at each menstrual epoch; it is, however, more than probable that rupture may occur at other moments also, and one of such

occasions is believed to be during coitus. In any case, it is obvious that an overwhelming number of these follicles never reach maturity.

The follicle at the stage above mentioned—the earliest stage at which it need be described for our present purpose—is contained in an envelope formed by a condensation of the ovarian tissue around it into an ill-defined outer *tunica fibrosa*, and a stratum internal to this, the so-called *tunica vasculosa*. Its cavity is lined with a layer of granular cells, two or three deep, the *tunica granulosa*. These cells at one place are heaped up into a thalamus, on which the ovum rests, and the ovum is roofed in on its central aspect by a layer of the cells (fig. 1). This thalamus, the *discus proligerus* (*disc. prol.*), lies sometimes on the side of the follicle towards the surface, sometimes on the deeper side.

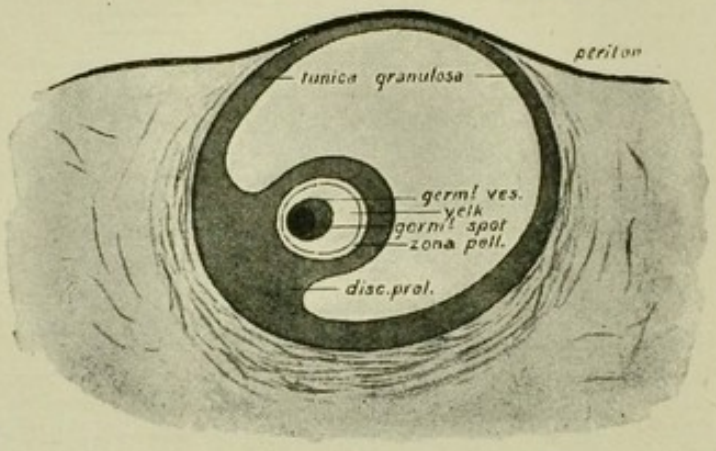

Fig. 1.—Diagram of Graafian Follicle. *Perit*, peritoneum. The other lettering is explained in the text.

The ovum is a single cell with a nucleus, the *germinal vesicle* (*germl. ves.*), and a nucleolus, the *germinal spot*. Its cell-wall is called the *zona pellucida*, and is a firm translucent membrane faintly striated in a radial pattern. Its main contents, in which the nucleus lies, consist of a granular fluid, the yelk. The ovum at this stage has a diameter of $\frac{1}{125}$ of an inch.

Rupture of Follicle. Formation of Corpus Luteum.—When the Graafian follicle bursts, its contents are discharged among the fimbriæ of the Fallopian tube lying underneath it (fig. 2), and the ovum is guided into the opening of the tube by the ciliæ covering the inner aspect of the fimbriæ. It is in all probability fertilised at some time during its passage through the tube. It travels along towards the internal ostium, and passes through this into the uterine cavity, being propelled by the action of the ciliæ and possibly by the peristaltic contractions of the muscular wall of the tube.

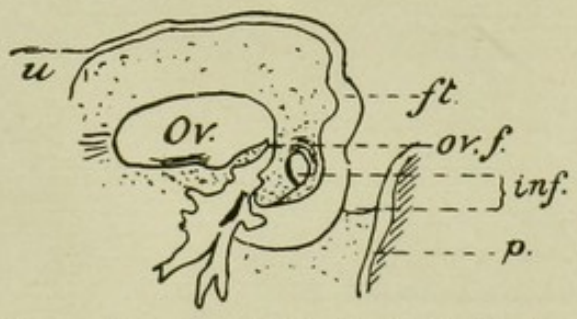

Fig. 2.—To show relation of infundibulum to ovary. *u*, uterus; *ov*, ovary; *ft*, tube; *ov. f*, ovarian fimbria; *inf*, infundibulo-pelvic ligament; *p*, pelvic wall. The uterus and inner end of the tube are raised to make the diagram clearer.

Corpus Luteum.—After the follicle has burst, its cavity becomes more or less distended with the blood effused in the process of rupture. The follicle is thus converted into a blood-cyst, with its walls lined by the remains of the tunica granulosa. This cyst is rather a larger object than the fully-developed follicle, and indeed occupies nearly half the bulk of the ovary (fig. 3). The blood is slowly absorbed, and during this process the cells of the tunica granulosa undergo a hyperplasia, and it bulges into the cavity of the follicle. The now somewhat stellate piece of partially de-

colorised clot (fig. 7) is inclosed by the thickened granular wall of the cyst. This wall is of a dull yellowish colour, and the structure is in consequence named the *corpus luteum*.

If the ovum becomes fertilised the corpus luteum develops for about three

Fig. 3.—Ovary a few hours after rupture of a follicle.

Fig. 4.—Corpus luteum 18th day. The clot, here pyriform, surrounded by the thickened tunica granulosa, is at the right-hand end of the figure.

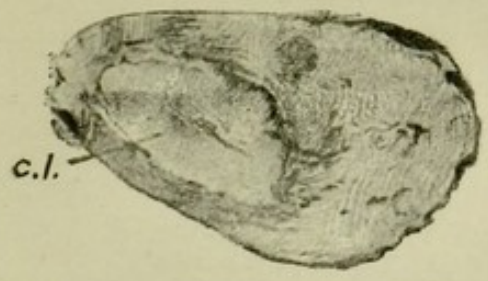

Fig. 5.—Corpus luteum (*cl*), at the 6th month of pregnancy.

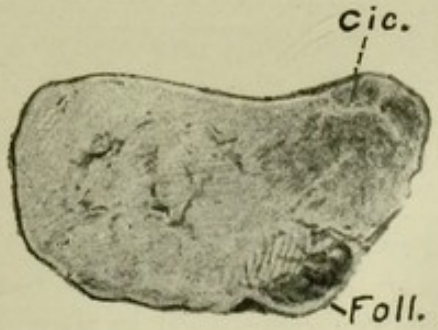

Fig. 6.—Cicatrix of corpus luteum (*cic*), 1 month after delivery. *Foll*, newly-developing follicle.

months. By this time it has a bulk much larger than hat of the original follicle, and almost as large as the original blood-clot first effused. It measures about two-thirds of an inch in diameter and it is impossible to overlook it in a section of the ovary. It remains in the same condition

during the rest of pregnancy, shrinking slightly to a diameter of about half an inch (fig. 5).

The bulged and convoluted granular walls become welded together into a mass which now obliterates the former cavity, except for a thin stellate figure, the remains of the original clot, in the centre (fig. 7, 3). Capillaries also develop in the walls. After delivery the corpus luteum shrinks rapidly,

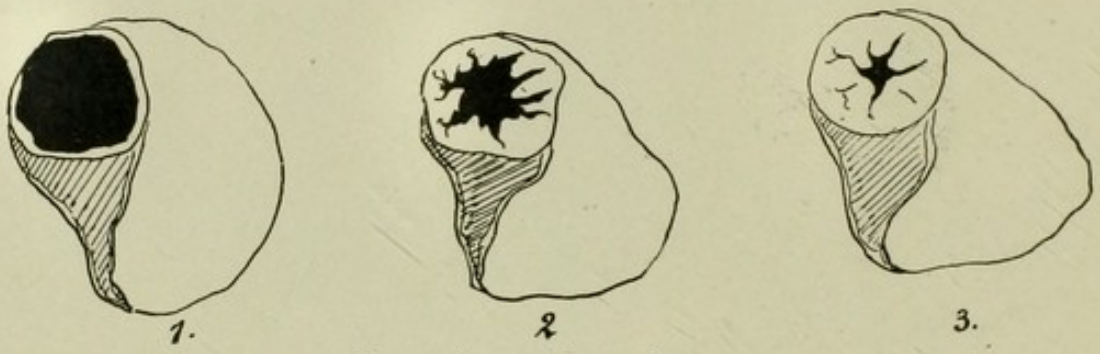

Fig. 7.—Stages of corpus luteum.

since the blood supply is very considerably diminished, and it becomes converted into a small mass of connective tissue and eventually into a cicatrix (fig. 6).

If impregnation does not occur, the follicle undergoes similar changes, but the corpus luteum in this case does not reach the same degree of development as in the case of pregnancy. The yellow body is formed and continues to grow up to the third week, instead of to the third month, and then it shrinks, being converted into a small cicatrix, just as happens after impregnation.

The corpus luteum *of pregnancy* has been called the true corpus luteum, while that of *menstruation* had the name of false corpus luteum. There is, however, no meaning in these names.

Constancy of occurrence in cases of pregnancy.—Supposing it has to be settled whether a dead woman, of whom only the ovaries are available for examination, has been pregnant at the time of death, or supposing the signs in other parts are doubtful, then the presence or absence of a well-developed corpus luteum in one of the ovaries has no absolute value as a medico-legal proof. This body has been found in the cases of uteri affected with myomata, and in the ovaries of prostitutes who were not, and never had been, pregnant.[1] The corpus luteum has, moreover, been absent in one or two cases of pregnancy.

Formation of Decidua.—If the lining membrane of the body of the uterus[2] is examined at the time at which the ovum reaches it, it will be found to be modified in structure. Its thickness is much increased, and its glands become enlarged in all dimensions (fig. 8). This growth continues to about the fifth month, by which time the decidua, as the endometrium is now called, measures about half an inch in thickness, and the glands are more dilated and very tortuous. Its more detailed changes will be alluded to later on.

[1] Popow, *Obst. Trans.* vol. xxiv, where other authors are referred to.

[2] The cervix uteri takes no part in the changes here described.

The ovum on its arrival in the uterine cavity finds itself lying on the somewhat irregular surface of this decidual membrane, in a depression of which, being still a minute body, it soon settles, and becomes adherent. It is assisted in fixing itself to the surface by certain projections like the pseudopodia of an amœba, which have appeared on its surface, and which are called *villi*. The

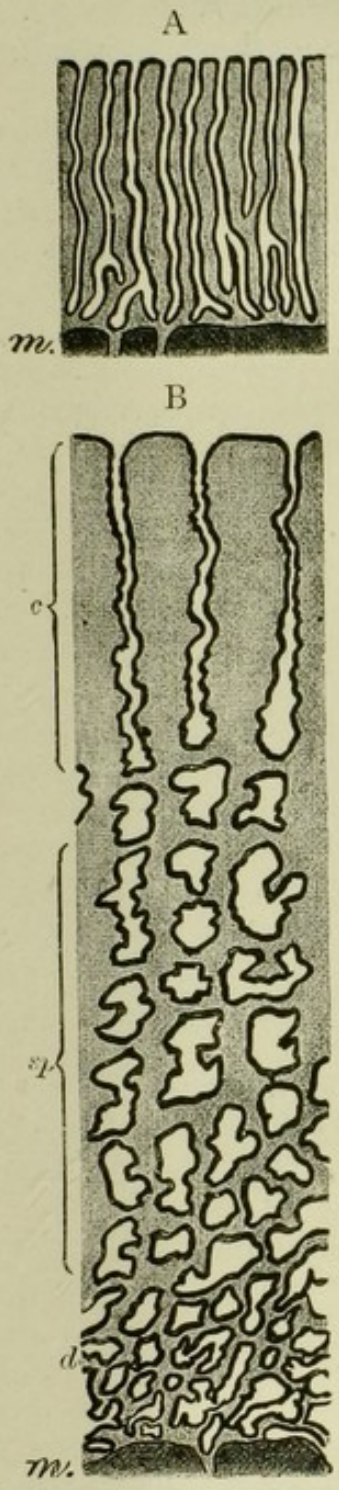

Fig. 8.—Diagrammatic sections of the uterine mucous membrane, showing the changes which the glands undergo with the supervention of pregnancy (from Kundrat and Engelmann). A, Diagram of the glands of the non-pregnant uterus; *m*, muscular layer. B, Condition of the glands at the beginning of pregnancy; *c*, compact layer near free surface of decidua: the glands are here somewhat enlarged but not very tortuous, and the mucous membrane is rendered compact by hypertrophy of the interglandular tissue; *sp*, spongy layer, containing the middle portion of the glands greatly enlarged and tortuous, producing a spongy condition in the mucous membrane; *d*, deepest portion of the glands, elongated and tortuous, but not much enlarged.

Fig. 9.—Stages in the inclusion of the ovum in the decidua.

zona pellucida forms the most external layer of the outer membrane of the ovum. This membrane is called the *chorion* (see p. 8, 'Chorion'), and from it the villi spring.

When the ovum is fixed in its place, the two folds of decidua between which it is embedded grow together over it and bury it. It is thus shut off from the cavity of the uterus (fig. 9).

The decidua which is in contact with the ovum is now specially named. The part covering in the ovum is called the *decidua reflexa* (see fig. 46*a*); that lying underneath the ovum, between it and the uterine wall, is called *decidua serotina*[1] (fig. 10).

As the ovum grows the decidua reflexa is bulged more and more into the cavity of the uterus, until about the end of the fourth month it comes into contact with the decidua covering the rest of the uterine surface, which is called the *decidua vera.*

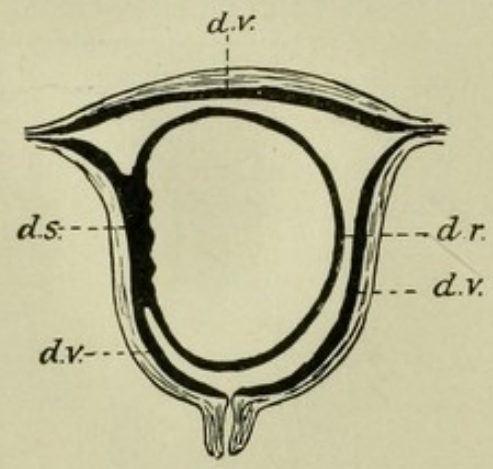

Fig. 10.—*d v*, decidua vera ; *d r*, decidua reflexa ; *d s*, decidua serotina.

Decidual Cells.—The interglandular part of the decidua hypertrophies as well as the glands, and there are developed in it the large epithelioid cells known as *decidual cells.* These are characteristic of this structure, and are conspicuous in microscopic sections which happen to contain decidual tissue, whether taken from the placenta or from the membranes (figs. 11 and 23 B).

Layers of the Decidua.—The dilation of the glands already spoken of is most marked at their middle and near their deeper ends. The effect of the dilation in the former position is that the membrane at this level has a reticulated appearance on section (fig. 8) ; the cavities in its substance are lined with the epithelium of the glands. There is a compacter

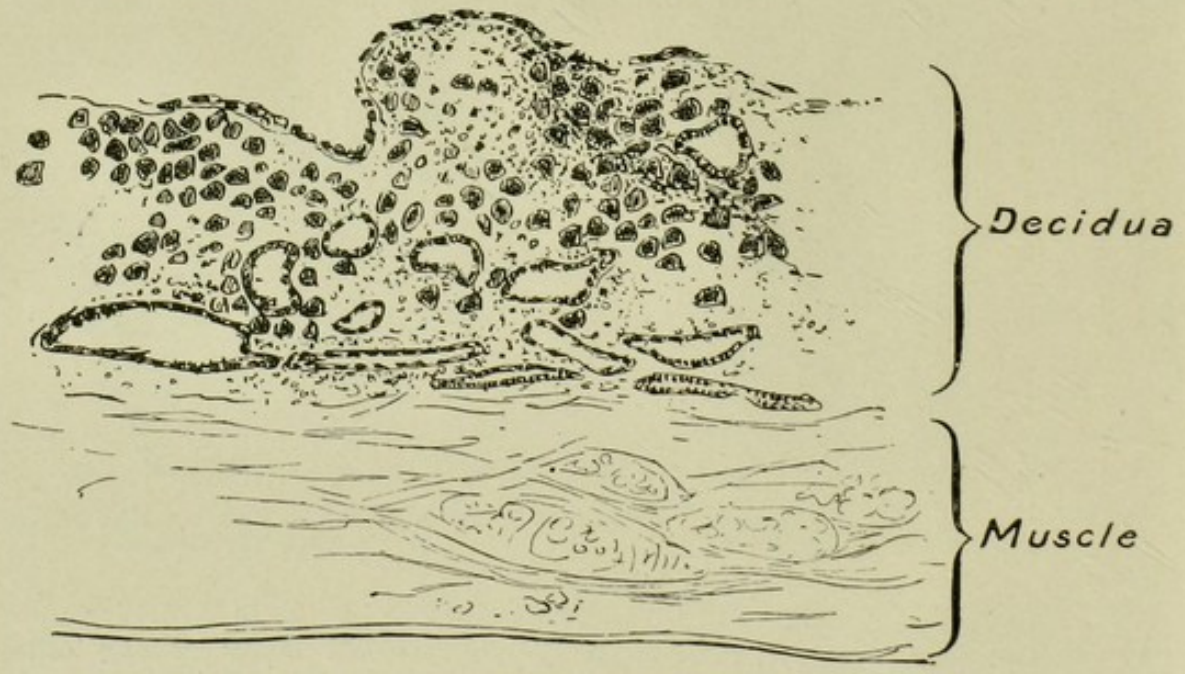

Fig. 11.—Section of decidua vera in situ, showing cells and some glands.

layer superficial to this, and a compact layer beneath it, the latter taking its name of *stratum compactum* from its appearance. The reticulated layer is

[1] Serótĭna, so called by William Hunter, who taught that the ovum on its entrance into the uterus got behind the layer of decidua covering its walls, and that subsequently a layer formed beneath it. The serotina, a word coined from serus, late, is in analogy with diutinus, matutinus. The word is usually pronounced as above indicated, but in matutīnus the *i* is long, though it is short in diutĭnus.

named the *ampullary*, or *spongy layer*. It is of great importance, as it is through this layer that the line of separation runs when the decidua, both the d. serotina and the d. vera, is cast off in the process of labour. This layer serves the same purpose as the perforations between postage stamps (fig. 12).

At the end of the fourth month when the decidua reflexa, owing to the growth of the ovum into the uterine cavity, comes into contact with the decidua vera, the latter begins to atrophy, probably on account of its being compressed. The glands become gradually obliterated in the two compacter layers, and those in the ampullary layer lose their epithelium and become flattened out.

The reflexa is also thinned before it comes into contact with the vera, and by the time this happens there is hardly a trace of the glands to be found in it. Towards the cervix the gland-spaces in the fused layers become fewer and the decidual cells smaller (Webster).

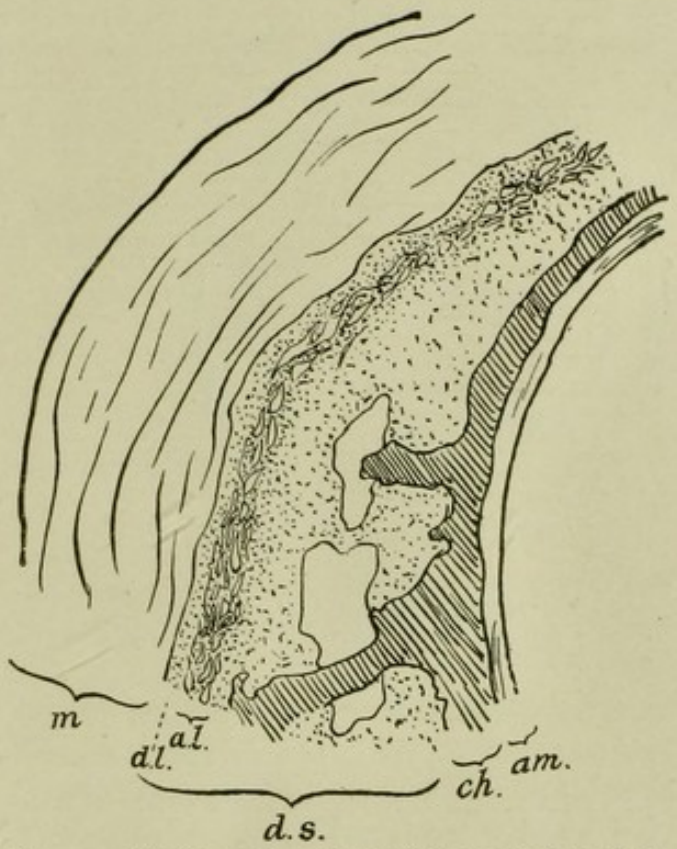

Fig. 12.—Uterine wall and membranes at edge of placental site. *m*, muscle; *d s*, decidua serotina; *d l*, deepest layer (stratum compactum); *a l*, ampullary layer; *ch*, chorion; *am*, amnion.

The special changes which occur in the superficial layer of the serotina, resulting in the formation of the maternal part of the placenta, will be described later.

Changes in Ovum.—The processes which go on in the ovum itself may be now briefly referred to.

When fertilisation has taken place the yelk begins to undergo segmentation. The yelk-mass thus becomes divided up into two, four, eight, sixteen, thirty-two, and so on, and each segment of the mass thus formed is a nucleated cell. When the process is accomplished, some of the cells arrange themselves in a layer round the periphery of the ovum, and form a membrane enclosing the rest. The ovum then increases in size by the appearance of a quantity of fluid in the central part. Those cells which are enclosed adhere in a mass to one spot on the inner surface of the lining formed by the peripheral cells, and spread out into a lenticular patch, the *embryonic area* (fig. 13). The spot where the adhesion takes place is the spot at which the embryo is about to be formed.

Between the outer layer and the layer of adherent cells—which are named, the outer one *epiblast*, and the inner one *hypoblast*—a middle one grows from the angle of their union, the *mesoblast*.

The ovum now consists of four layers surrounding a cavity containing

fluid : most externally the zona pellucida, then in order inwards the epiblast, mesoblast, and the hypoblast. At the spot marking the site of the future embryo the three innermost layers are fused together.

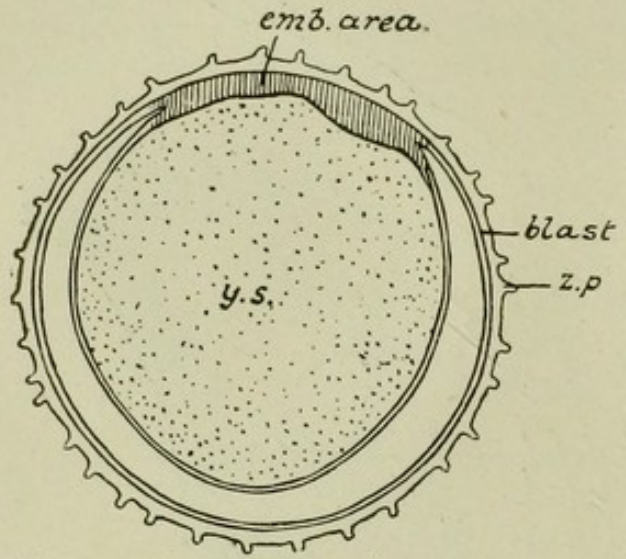

Fig. 13.—*emb. area*, embryonic area ; *z p*, zona pellucida ; *blast*, somatopleure ; *y s*, yelk-sac inclosed by splanchnopleure (*blast* and *z p* = chorion).

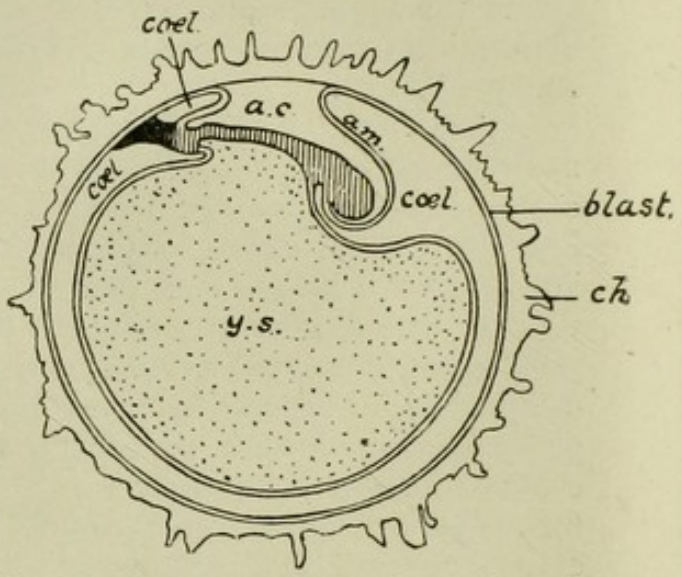

Fig. 14.—*Blast*, somatopleure ; *c h*, outer layer of chorion ; (*blast* and *c h* = chorion) ; *y s*, yelk-sac ; *cœl*, cœlom ; *am*, amnion ; *a c*, future amnionic cavity.

The mesoblast splits into two layers, one of which is united to the epiblast, the combination forming the *somatopleure*, and the other to the hypoblast, forming the *splanchnopleure* (figs. 13 and 14).

Round the cells which are to form the embryo a groove appears on the surface of the membranes, beginning at the head end, and the embryo is thus defined from the general surface.

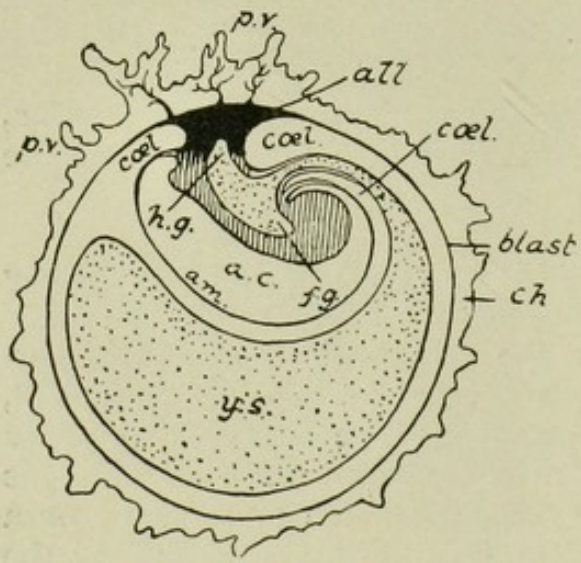

Fig. 15.—*p v*, placental villi ; *all*, allantois ; *cœl*, cœlom ; *blast*, somatopleure ; *ch*, outer layer of chorion ; *am*, amnion ; *a c*, amnionic cavity ; *f g*, fore-gut ; *h g*, hind-gut ; *y s*, yelk-sac. N.B. —The embryo now hangs with its dorsal surface away from the allantoic attachment.

The embryo now sinks towards the centre of the ovum, and the walls of the groove in which it thus comes to lie consist of somatopleure only, the splanchnopleure sinking with the embryo (fig. 14). These somatopleuric walls grow up over the back of the embryo, rising from the head end, the tail end, and the sides. They meet over the back, abut against one another, and coalesce so as to form two distinct membranes. Of these, the inner—that next the embryo—forms a complete sac, the *amnion* (*am.*)

The outer becomes united to the inner surface of the zona pellucida, and in combination with this forms the external membrane of the ovum, the *chorion* (figs. 14, 15, 18, 19, 20, *blast. and ch.*)

Between the amnion and the layer of blastoderm which has thus joined in forming the chorion, there is a space, the cœlom, or pleuro-peritoneal space, which is continuous with the cavities of the peritoneum and pleura now in process of formation.

The surface of the amnion looking inwards toward the back of the embryo is the one which is formed of the epiblastic layer of the somatopleure, and is continuous with the epithelium covering the body of the embryo.

As the body of the embryo begins to close on its ventral aspect by the growing together of the anterior abdominal and thoracic walls round what will

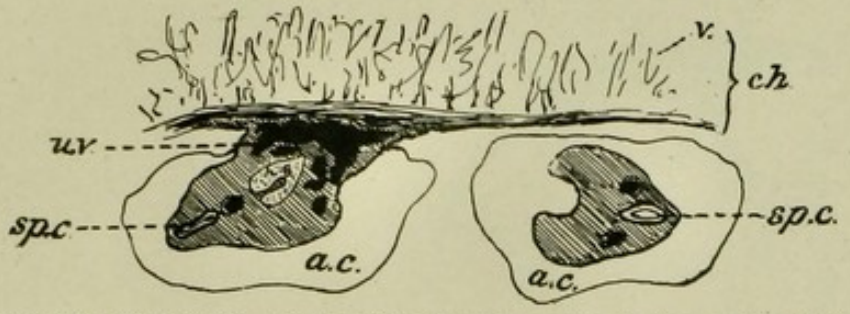

Fig. 16.—Formation of allantois. Section through head and tail of an embryo lying on its side. (Adapted from Lockwood, 'Phil. Trans.,' vol. 179, B, p. 365.) *a c*, amnionic cavity; *v*, villi; *ch*, chorion; *u v*, umbilical vessels; *sp c*, spinal column; *h g*, hind-gut. (About the stage of fig. 14.)

be the umbilicus, the edges of the abdominal and thoracic walls from which the amnion springs (see fig. 18) are carried in towards the central point too, and by their approximation form one end of a tube which will enclose the structures forming the umbilical cord.

While these changes are going on, the splanchnopleure, which sank into the interior of the ovum with the embryo, has assumed the appearance of a sac with a pedicle, named the *umbilical vesicle*, or *yelk-sac* (*y.s.*) It contains the remainder of the yelk, and its pedicle is the umbilical duct (*u.d.* fig. 20). This pedicle lies in the tube formed by the amnion.

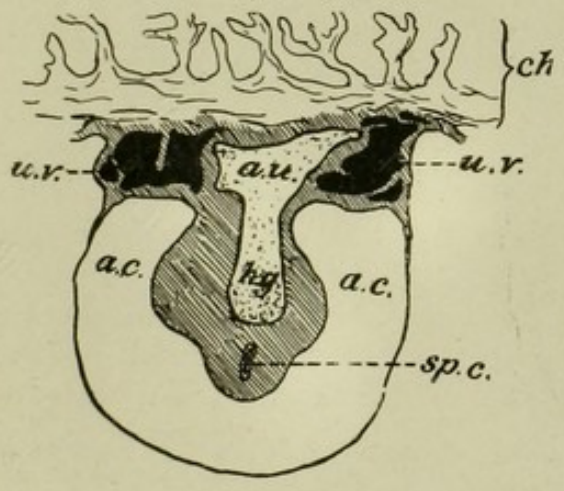

Fig. 17.—Formation of allantois (after Lockwood). *ch*, chorion; *u v*, umbilical veins; *all*, allantois; *h g*, hind gut; *a c*, amnionic cavity; *sp c*, spinal cord. (About the stage of fig. 15.)

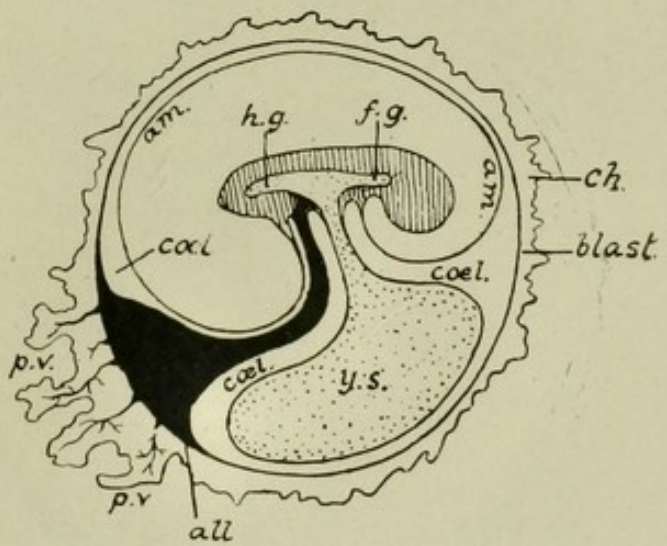

Fig. 18.—*p v*, placental villi; *all*, allantois; *cœl*, cœlom; *blast*, somatopleure; *ch*, outer layer of chorion; *am*, amnion; *fg*, fore-gut; *hg*, hind-gut; *y s*, yelk-sac.

Allantois.—When the embryo sinks into the ovum it remains attached at the tail-end to the chorion (fig. 14). Its attachment, the *allantois*, consists of tissue continuous with that forming the hind part of the body, and surrounding the hind-gut. In its substance are vessels, the *umbilical vessels* (*u.v.* figs. 16 and 17), which very early become extended into the chorion, and convert the villi into vascular processes. This vascularisation of the villi is

said in the first instance to extend over the whole superficies of the ovum, but it soon becomes limited to a comparatively small area, the site of the future placenta. The place of attachment, which was at first at the tail-end of the embryo, becomes shifted round to the front (figs. 14 and 15) by growth of the hind-end of the embryo to form the continuation (tail) of the embryonic axis. The allantois will be seen to be another of the structures lying in the tube of amnion, and it becomes elongated as the embryo retreats more into the middle of the ovum.

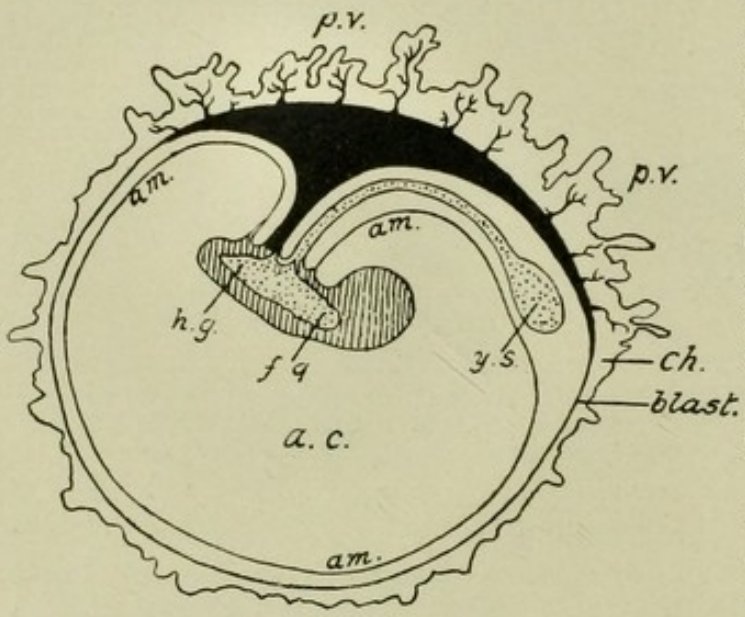

Fig. 19.—*p v*, placental villi; *blast*, somatopleure; *ch*, outer layer of chorion; *am*, amnion; *a c*, amnionic cavity; *fg*, fore-gut; *hg*, hind-gut; *ys*, yelk-sac.

The umbilical duct is lengthened by the same process, and the contents of the vesicle being absorbed by the embryo, the duct and vesicle both atrophy. At full term the remains of the vesicle can occasionally be found on the fœtal surface of the placenta, lying under the amnion. Sometimes the intra-abdominal part of the duct persists after the umbilical cicatrix has closed, in the shape of Meckel's diverticulum. The allantois soon atrophies, and is lost in the tissues composing the umbilical cord.

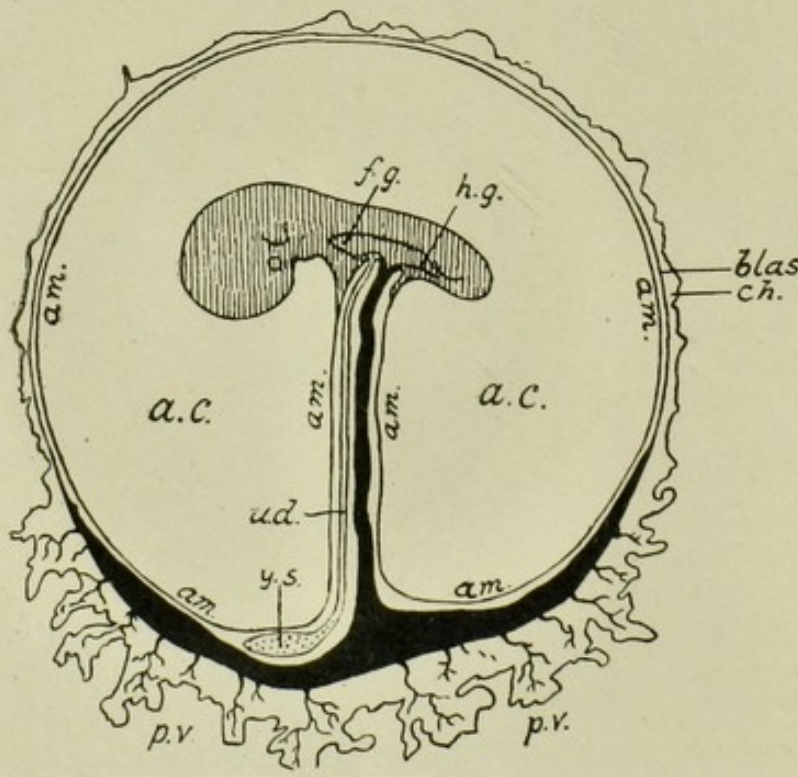

Fig. 20.—*p v*, placental villi; *blast*, somatopleure; *ch*, outer layer of chorion; *am*, amnion; *a c*, amnionic cavity; *fg*, fore-gut; *hg*, hind-gut; *ys*, yelk-sac; *u d*, umbilical duct. (Figs. 18, 19, 20 show the further changes in the ovum.)

Chorion.—The first villi of the chorion, before the somatopleure became united to the zona pellucida, were simple, becoming branched after this union took place. They extended over the whole superficial area of the ovum, and became fixed to the decidua (serotina and reflexa) with which they were in contact. They then, as has just been seen, received a vascular equipment from the allantois. Soon after this all those over the surface which is not about to take part in the formation of

the placenta are found to be atrophied, but those over the placental area develop further, and eventually form the villi of the placenta.

Development of the Placenta.—The placenta consists of a maternal and a fœtal part ; the maternal portion is formed of the modified decidua serotina, of which the layer superficial, or rather internal, to the ampullary layer alone takes part in its construction ; and the latter is constituted by the fully developed chorionic villi.

Maternal part.—The whole of the superficial layer, except a narrow film of membrane lying immediately on the ampullary layer, takes part in the change. This consists in its conversion into a series of communicating sinuses, which form an irregular space, the intervillous space, containing maternal blood. This space

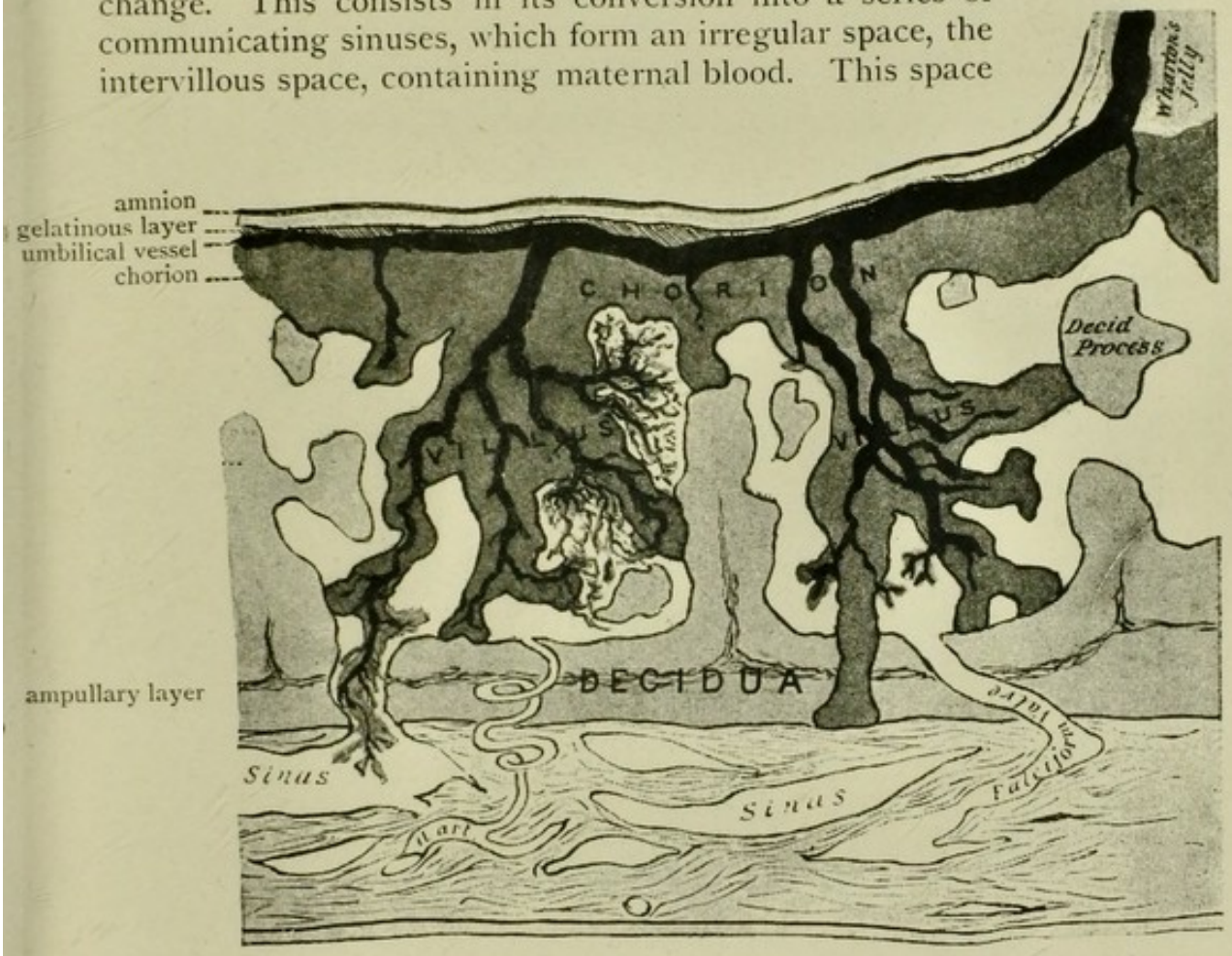

Fig. 21.—Diagrammatic section through placenta near centre. The villous tufts are only indicated at one place for the sake of clearness. *u. art*, uterine artery.

is intersected by bands and imperfect septa, the remains of the solid decidua which has been, so to speak, excavated ; and the fœtal villi float freely in the maternal blood contained in the space. The sinuses, which by their union form this space, have been considered as enormously dilated decidual capillaries ; they may, however, turn out to be developed from chorionic elements.[1]

The villous tufts number from twenty to forty, and each tuft, as it lies in contact with the decidua, becomes enclosed in a wall of decidual tissue, which rises up around it (fig. 21). A villus thus clothed is recognised as a

[1] For a clear exposition of our present knowledge of the development of the placenta in man, see a paper by Eden, *Journal of Pathology and Bacteriology*, 1895, in which the origin of the intervillous space is discussed.

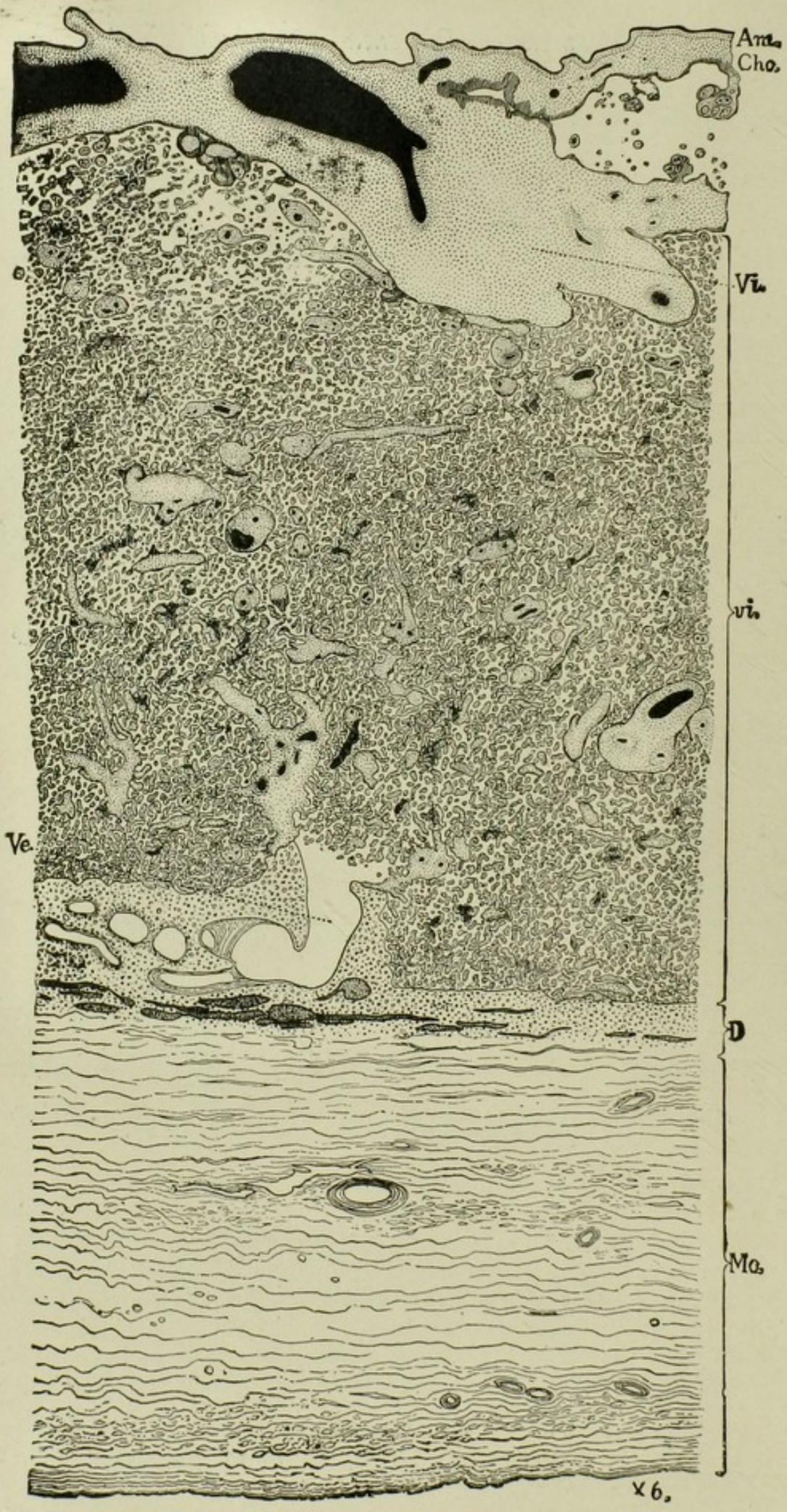

Fig. 22 (for description see foot of p. 13).

lobule or *cotyledon* of the fully developed placenta, and the wall of decidua which rises around it is named a *decidual process*. Into the bases at least of the decidual processes, and in some cases higher, there is carried up a prolongation of the ampullary layer (fig. 21). Some of the decidual processes grow up to the surface of the chorion, and become attached to it in the spaces between the villi, as shown in the same diagram; and on section of

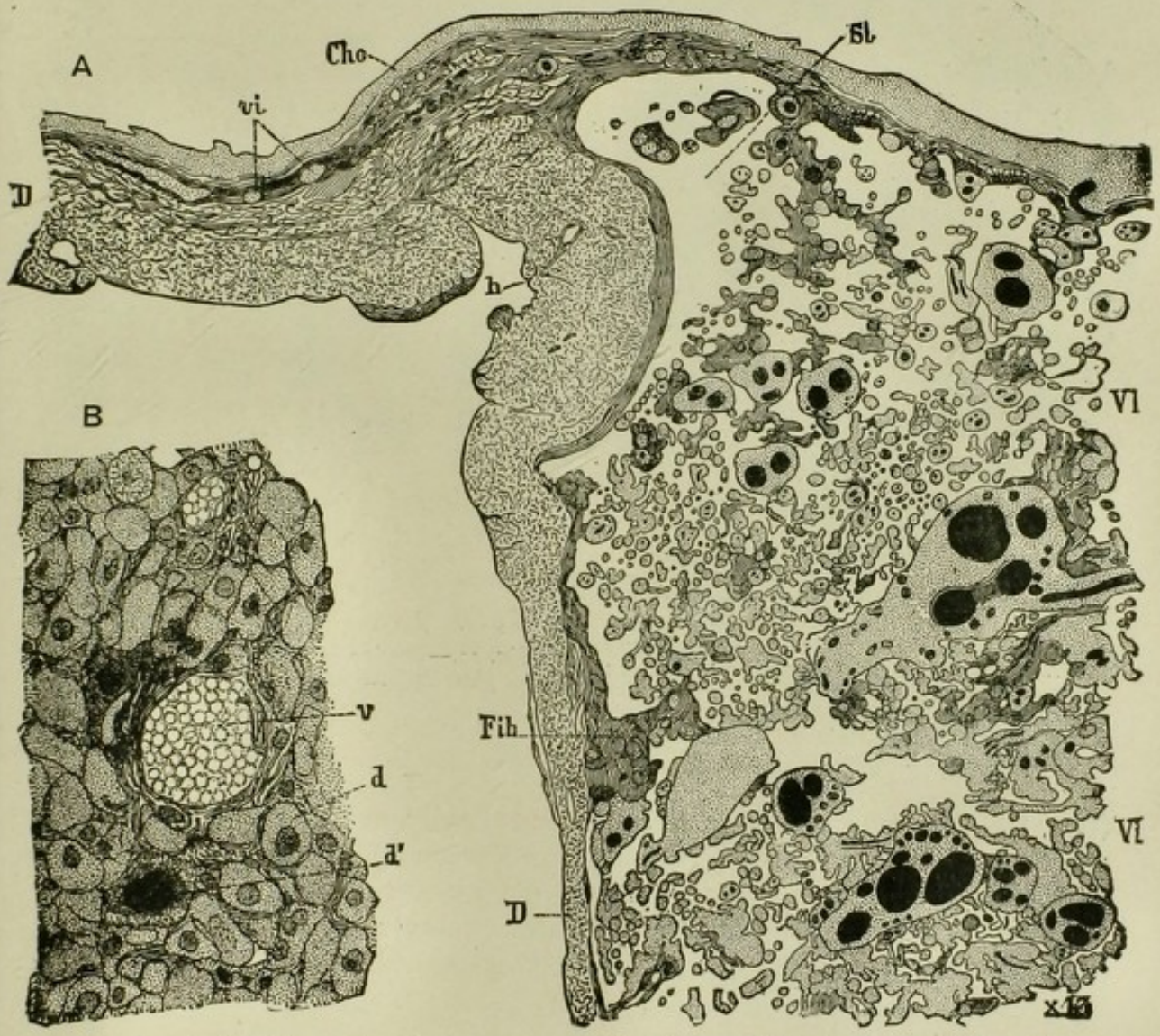

Fig. 23.—Sections illustrating the structure of the placenta (Minot). A, vertical section through the margin of a placenta at full term; *D*, *D*, deep layer of decidua; *Vi*, chorionic villi variously cut, their blood-vessels injected; *Si*, marginal space of the placenta, nearly free from villi; *vi*, aborted villi beyond the placenta; *Fib*, canalised fibrine of Langhans, produced, according to Minot, by transformation of the superficial layer of the chorionic epiblast. B, decidual tissue from a placenta at full term; *v*, a blood-vessel; *d*, *d'*, decidual cells the latter with several nuclei.

the placenta smaller processes branching off from the main processes are seen, and form the imperfect bands and septa alluded to above.

Fœtal part.—The greater number of the villi forming this part of the

Fig. 22.—Section through a normal placenta of seven months in situ (Minot). *Am*, amnion; *Cho*, chorion; *Vi*, root of a villus; *vi*, sections of the ramifications of villi in the intervillous spaces, the larger blood-vessels within them are represented black; *D*, deep layer of the decidua, showing flattened remnants of enlarged glands in spongy stratum; *Ve*, uterine vein (? artery) opening out of placental sinus; *Mc*, muscular wall of uterus.

placenta float freely in the maternal blood-stream (figs. 22 and 23); but the ends of some of them are firmly united to the film of decidua (basal layer) lying on the ampullary layer, and some are attached to the decidual processes and their branches, while some few extend into the uterine sinuses themselves

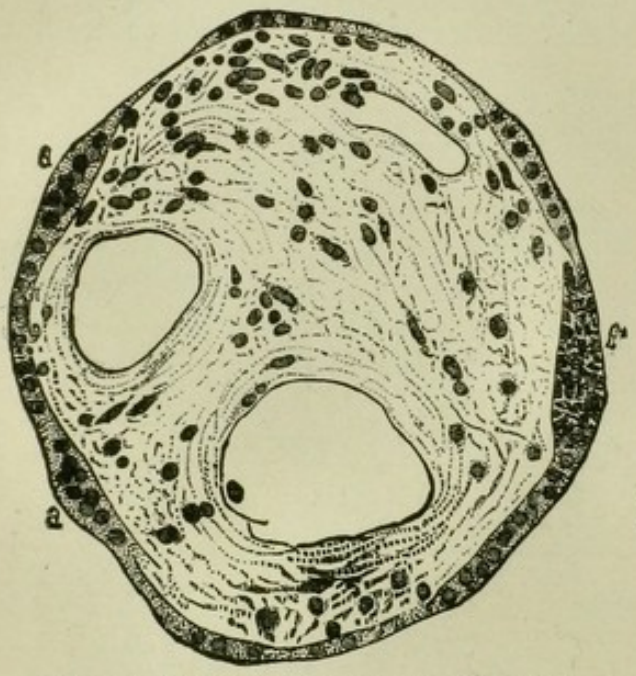

Fig. 24.—Transverse section of a villus from a placenta of seven months (Minot). Three blood-vessels are seen within the villus, imbedded in a jelly-like connective tissue containing cells and fibres; *a*, *a*, cell-layer covering villus (epiblast according to Minot; according to others of decidual origin); *f*, a thickened portion of this cell-layer, which has undergone a fibrinous transformation (canalised fibrin).

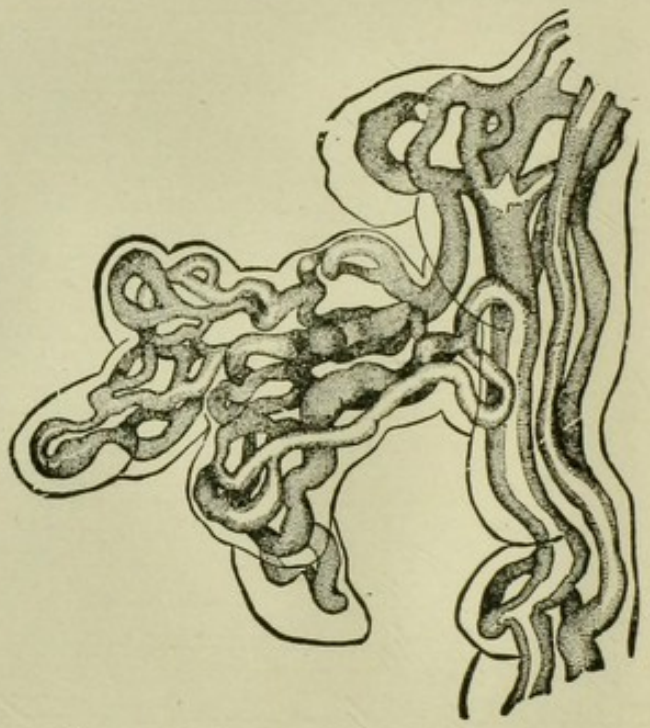

Fig. 25.—Portion of an injected villus from a placenta of about five months (Minot).

(fig. 21). The mass of villi fills up the sinus cavity, and gives to the placenta, on section, the appearance of a fairly firm fibrous structure.

Each villus (figs. 24 and 25) consists of a process of connective tissue of an embryonic type, carrying a loop of vessels—namely, an artery and vein, and covered with two layers of epithelium, one of which belongs to the villus

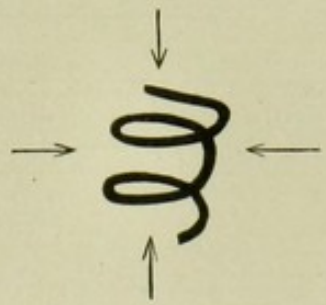

Fig. 26.—Curling artery.

Fig. 27.—Falciform 'valve.'

originally, and the other, the more superficial one, may be the layer of cells lining the sinuses, if the older theory of their decidual origin is still held, which the villus has carried before it as it grew into the cavity of the sinus; or it may be a special layer, the trophoblast, from which many of the sinuses are in all probability formed.

Efferent and Afferent Vessels.—The sinuses are supplied with maternal blood by arteries derived from the uterine artery, which run in a corkscrew (figs. 21 and 26) form through the ampullary layer; and the blood is returned by veins which traverse the same layer, and are directed obliquely towards the peritoneal surface of the uterus, many of them having an elbow in some point of their length. This spiral and oblique method of arrangement of the vessels is most useful when the placenta has to be detached during labour from the surface of the uterus; for by the contraction of the uterine muscle (as shown by the arrows) the limbs of the angles can be effectually compressed against one another, and the hæmorrhage which would occur without some mechanism of this kind entirely arrested. The bend in the veins has been called a falciform 'valve' (figs. 21 and 27).

The placenta begins to develop during the second month, and is completed during the third. It continues to grow in proportion to the size of the fœtus until full, or nearly full, term; but before that time is reached, a certain amount of degeneration has begun to show itself in its vessels and tissues.

CHAPTER II

PLACENTA AND MEMBRANES AT TERM

Placenta at Term. *Situation of the Placenta in Utero.*—The placenta is attached almost altogether in the upper part of the uterus. Its site usually occupies part of the anterior or posterior wall, perhaps a little more often the posterior than the anterior. It is usually more or less to one side, and extends some short distance on to the fundus. It is very rarely situated on the fundus. Under normal circumstances its lower edge does not approach to within about four inches of the internal os (see *Placenta Prævia*, p. 341). It is never inserted on the cervix, for the mucous membrane of this part never undergoes decidual changes.

Description of Placenta.—The placenta, when delivered, is found to be a discoid body seven or eight inches in diameter. Its thickness is about an inch to an inch and a half in the centre, and diminishes towards the edge, where it somewhat abruptly merges into the membranes. The amnion covering its fœtal surface is continuous with that lining the rest of the chorionic cavity, and is continued to form the sheath of the umbilical cord (fig. 20).

The chorion entering into the formation of the placenta is continuous with the chorion forming the sac which surrounds the ovum (figs. 20 and 28).

The decidua serotina, whose superficial layer is now interlocked and compacted with the villi, is traceable at the placental edge into the decidua vera; the two deeper layers, the compact, and the ampullary undergoing no change at this edge, and the superficial layer which forms the maternal part of the placenta being altered in structure as already described.

The placenta has two surfaces to be described, a maternal and a fœtal one.

The maternal surface is of a dark reddish-brown colour, coated over with a thin film of greyish membrane. This membrane is very friable, and is seen to be missing in many spots. It consists of the part of the ampullary layer still adherent to that layer of decidua which has come to form the maternal part of the placenta. The placental surface is divided into twenty or thirty lobules or cotyledons by sulci, which dip to a varying depth into the substance of the placenta. Into each sulcus, which corresponds to a main decidual process, there is continued a prolongation of the ampullary layer, and the cotyledons can be separated from one another without tearing the tissue, to as far as this layer extends towards the chorion.

It is very rarely that the openings of the spiral arteries and the veins can be found.

In a normal placenta there is no spot where the tissue has been torn, and so no villi are exposed. At the edge of the organ the greyish film, if carefully

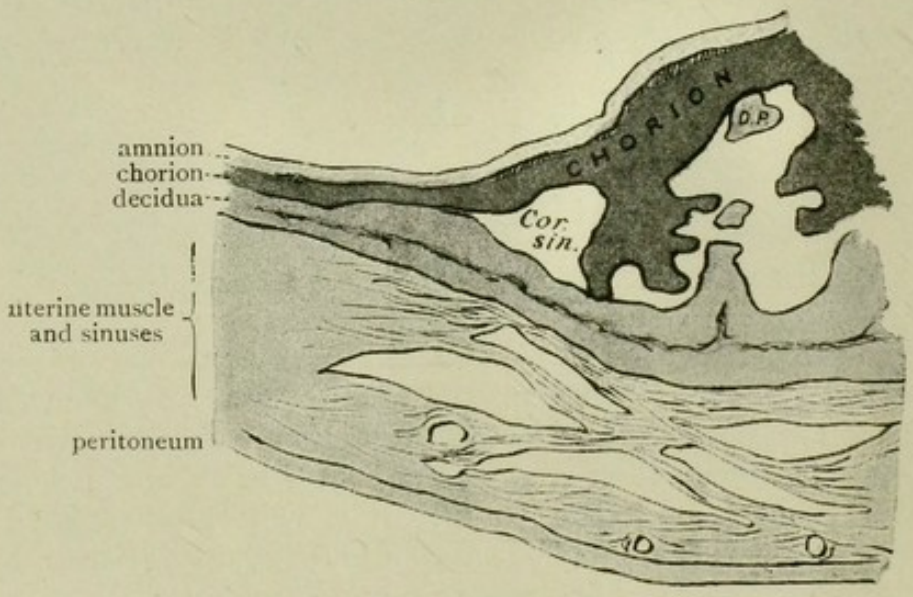

Fig. 28.—Section through edge of placenta. *DP*, decidual process; *cor. sin*, coronary sinus. The decidua at the edge merges into decidua vera.

traced, is found to be continuous with a similarly friable layer covering the membranes.

The fœtal surface is different in character. It is smooth, owing to its covering of amnion. Beneath this membrane the large vessels may be seen running tortuously on the chorion, and dividing into branches for the supply of the villi in the cotyledons, into which these branches dip at a right angle. In a deeper stratum than the vessels the dark granular placental chorion can be seen through the transparent amnion. In a small percentage of cases (about two per cent. in a large number of placentæ examined by the author) the remains of the yelk-sac or umbilical vesicle may be found, usually a few inches from the insertion of the cord, and looking like a well-defined bit of yellow putty about the size of a split pea.

On section the thickness of the placenta is seen to be made up of a dark reddish-brown fibro-granular material, with some lighter-coloured fibrous bands of tissue intersecting it in various directions. Embedded in the granular material, which is the villous part of the placenta, is a certain amount of blood-clot, finely divided for the most part, but here and there,

especially at the edge of the organ, forming distinct clots. In many placentæ a sinus is cut across at the margin, the so-called *coronary sinus* (fig. 28); but this is not continuous all round the placental margin, and in fact can rarely be traced for as much as an inch as a definite tube.

On teasing out a portion of the villous part in water, it is at once seen to resolve itself into the characteristic seaweedlike structure already familiar in the chorionic villi of the early ovum (fig. 29).

On microscopic examination of a slightly magnified section of the placenta (figs. 22 and 23), it is seen to be composed mostly of villi of different

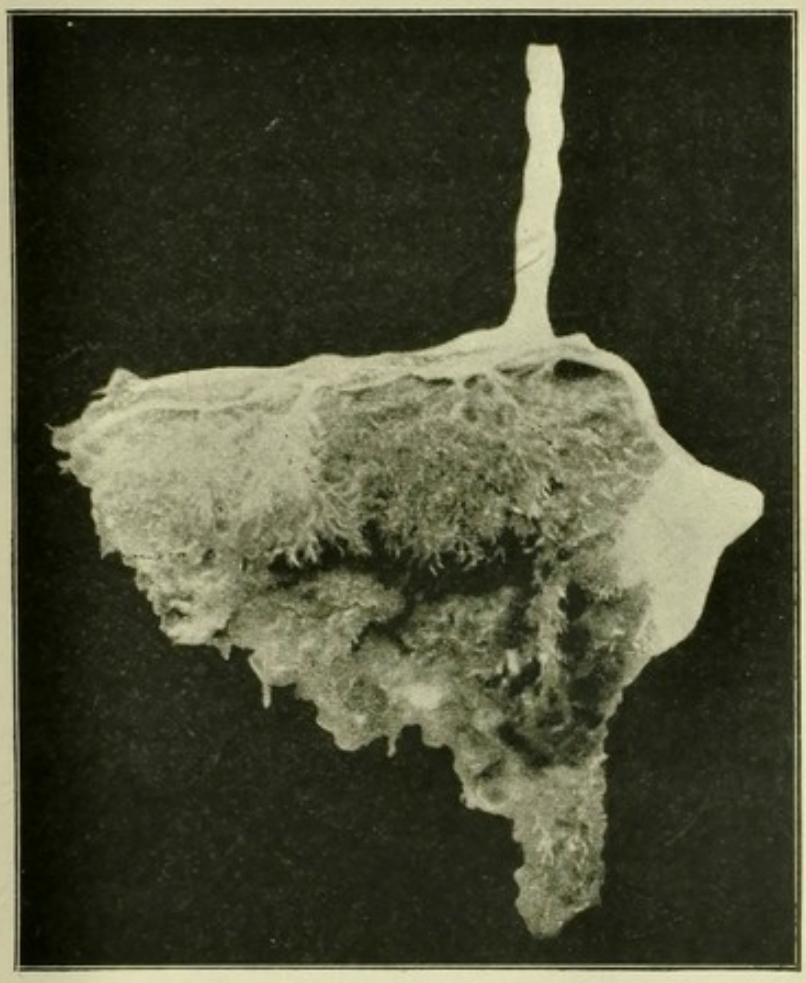

Fig. 29.—Small portion of a four months' placenta, showing root and ultimate twigs of one villus distinctly and one indistinctly.

sizes cut across in the section in various directions (*vi*). In each villus (fig. 24) there will be seen the vessels which it supports, and the covering of epithelium, of which it is in most places impossible to make out more than one layer. Scattered about as islets of different sizes are the decidual processes, and these are at once recognisable on account of the larger size and somewhat indefinite outline of their cells. At the maternal surface the decidua, if the section is made of a placenta in situ (fig. 22), is formed into a definite layer, through which the vessels may be observed to pass; and in the middle stratum of this are the characteristic meshes of the ampullary layer.

At the fœtal surface of the section the well-defined boundary of the amnion is seen to overlie the chorion, which is continued into the villi. In some places, lying mostly on the decidual processes bounding the sinuses, there are masses

and layers of multinucleated giant-cells (*fib*, fig. 23 A and fig. 58), embedded in a structureless translucent material. Some of this material is found in the vessels in the decidual layer, and partially or completely obstructs their lumen. The formation of this element begins during the fifth month of pregnancy, according to Friedländer. It is probably a condition which facilitates the more complete obliteration of the vessels by thrombosis that occurs after delivery of the placenta. This material is also found in the sinuses of the uterine wall at the same period. After labour the cells and fibrinous matter in the uterine sinuses become converted into connective tissue, and the site of a former sinus can be recognised in the walls of the uterus for many months after a pregnancy by the presence of this connective tissue, whose fibres are arranged in a more or less concentric manner. This will be again alluded to on p. 42, and under the heading of Evidence of Parity (p. 223).

On catching up a piece of amnion at the edge of the placenta, it will be found that this membrane can be readily stripped off the chorion, and a *gelatinous layer* (fig. 21) will be exposed, separating the amnion and chorion, and enveloping the upper surface of the large vessels which are here ramifying. This is the remains of the space (cœlom, pleuro-peritoneal space) between the true and false amnion (see figs. 14 to 20). At the base of the umbilical cord, however, the amnion is no longer further detachable, and is firmly adherent to Wharton's jelly, which is to be described.

Membranes at Term.—The amnion and chorion, with the shreddy remains of the decidua, are seen, when they are examined after delivery, to form a sac. This sac has been ruptured at one spot, the situation of the internal os ; and if the hole made is not a larger one than is necessary for the passage of the child, the shape and general characters of the membranes and their relation to the placenta while in utero can be made out. If the membranes have been badly torn, this may be impossible.

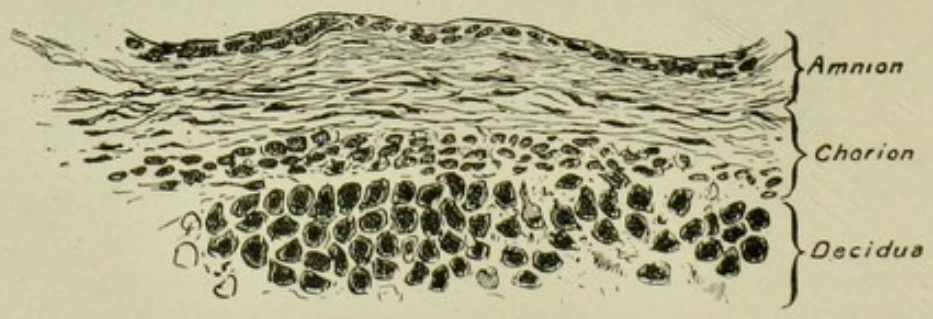

Fig. 30.—Section of membranes. The section does not include the ampullary layer of the decidua.

The placenta and membranes will be found to be turned inside out, so that the amnionic surface is on the outside, and the surface which was applied to the uterine wall looks towards the interior of the bag. The inversion is due to the mechanism of delivery of the placenta (see p. 125).

Decidua.—This consists of the layer superficial (nearer the uterine cavity) to the ampullary layer. It is somewhat thicker than the decidual layer found on the maternal aspect of the placenta, since it is not fused with the chorionic villi, and remains a distinct layer, which moreover is composed of

the fused decidua vera and decidua reflexa. It is very friable, and if a small piece is pinched up by forceps or between the fingers, it is found that a long strip cannot be taken off the other membranes, but that it breaks at once. Its continuity with the decidua on the maternal surface of the placenta will probably not be directly traceable.

If the edge of the hole in the membranes be now examined, it will be found that the amnion and the chorion can be easily separated, and that they form two distinct layers of membrane as far as the edge of the placenta. Here the *chorion* merges into the fœtal substance of the placenta, and its identity with the membrane from which the villi spring can be made out.. It is a translucent fairly firm membrane, but not so strong as the amnion. On separating it from the amnion, thin fibrous threads are often to be seen, uniting the apposed surfaces.

Amnion.—This is the membrane which confers the toughness on the sac which contains the fœtus and liquor amnii, a toughness sufficient to enable the bag of membranes during labour to withstand a considerable pressure. The amnion is a transparent membrane, which forms a complete lining to the sac above mentioned, and is not interrupted or modified anywhere over this surface. Its relations to the substance of the umbilical cord will be presently described. It is as easily detached from the placental surface up to the insertion of the cord as it is from the chorion over the general surface of the sac. Over the placenta it is separated from the underlying chorionic structure by a gelatinous layer already mentioned, but under normal conditions it is elsewhere closely applied to the chorion.

The microscopic structure of the three layers, amnion, chorion, and decidua, is seen in the diagram (fig. 30).

Liquor Amnii.—This fluid fills the amnionic sac. Its quantity varies within one and two pints in the normal state. It is a light-coloured, usually turbid fluid, watery, and of a specific gravity of about 1010 at term, though in the earlier months this is as high as 1020. In the earlier months, too, it has a greater bulk in proportion to the fœtus than it has at term.

In solution there are found small quantities of chlorides and phosphates, a trace of albumin, and, in the later months, a variable quantity of urea. Suspended in it are flakes of vernix caseosa, lanugo, and epithelial scales.

Its source is not definitely agreed upon. It has been believed to be secreted by the maternal vessels in the uterine walls, and to exude through the membranes ; but in all probability it is a fœtal product. Liquor amnii is found in the ova of birds, and in that case it must be produced quite independently of direct maternal sources.[1] That some of it comes from the kidneys of the child is probable, on account of the urea it contains ; though the small percentage of urea (not more than ·3 or ·4) may be imagined to be within the capacity of the skin to excrete. It is very likely that the fœtal kidneys do secrete urine, for in cases of occluded urethra the urinary passages are almost always found distended with fluid having most of the characters of urine, though of low specific gravity. It must in any case require

[1] Jungbluth has described a system of vessels ramifying in the amnion, in the neighbourhood of the placenta, which he believes supply the liquor amnii, and which atrophy before the later months are reached.

a considerable muscular effort on the part of the abdomen to get rid of its contents completely, since the viscus is deprived of the action of gravity as an aid to evacuation, and it is a common experience that a distinct effort is needed even by an adult to micturate while immersed in water up to the neck.[1]

All that can be said, therefore, as to the origin of the liquor amnii is that it is probably fœtal.

Its uses are numerous. During pregnancy it forms a medium in which the embryo or fœtus can develop in any direction without restraint, since no one part is pressed on more than another ; the free movements which appear necessary to the growth of the child are not restricted ; shocks due to falls of the mother, or to blows on her abdomen, are only transmitted gently to the child ; the circulation in the cord and placenta is not interfered with if the uterus contracts. During labour it forms, by virtue of its fluidity, the most perfect dilator possible of the cervix, as will be explained ; it protects

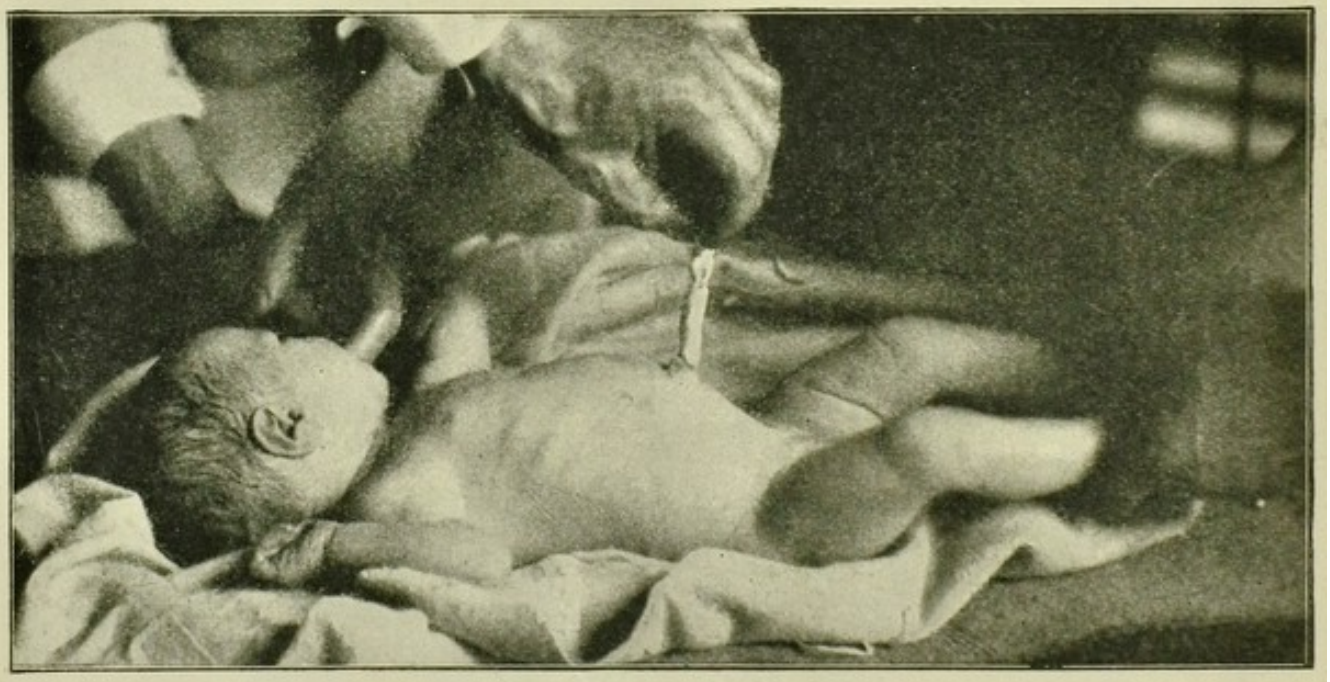

Fig. 31.—A child a few hours old. The junction of amnion and skin is easily seen at about three-quarters of an inch above the general surface of the abdomen.

the child from the great pressure which is brought to bear on the uterine contents during the dilating stage.

The albumin contained in it has been supposed to help to nourish the child, for some of the substances found in the fluid are occasionally seen in the alimentary canal of the child ; but there is not enough albumin to be of any service in nutrition, so that if any of it is swallowed it is most likely an accidental occurrence.

Umbilical Cord.—The umbilical cord springs from the fœtal surface of the placenta, except in a few cases where it comes off the amnionic surface beyond the edge of the organ. It is inserted into the umbilicus of the child, where its vessels enter the abdomen. Its sheath of amnion becomes

[1] The bladder is often found to be full after delivery, especially in cases where the breech is born first, and possibly the escape of urine during intra-uterine life is an overflow from an over-distended bladder.

continuous with the skin of the abdomen, which projects for from half an inch to one inch from the surface (fig. 31), and the mucoid tissue known as Wharton's jelly abuts on the subcutaneous connective tissue. It is usually about twenty inches long, and varies in thickness from three-quarters of an inch to, in places where the jelly which makes up the greater part of its bulk is absent, merely the thickness of the vessels which it contains. Its surface is marked by spiral lines and grooves, indicating the twisting which has occurred during pregnancy. This twist is, in a large majority of cases, from right to left, or in the opposite direction to that of a corkscrew. In the earlier weeks the cord is straight, and the twisting which takes place is due to fœtal revolutions during the earlier and middle months of intra-uterine life.[1]

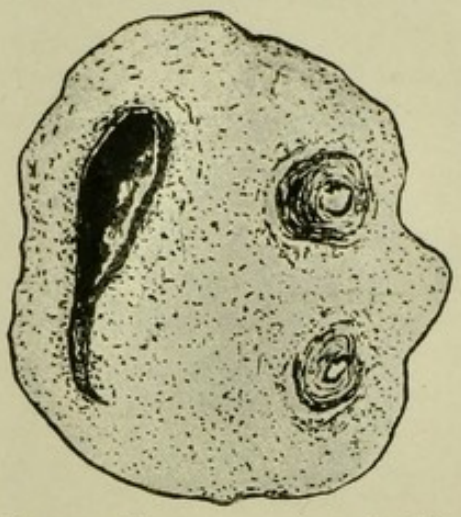

Fig. 32.—Transverse section of umbilical cord, showing the two arteries and the vein. The walls of the vessels have shrunk slightly.

If a section is made across the cord (fig. 32), it is seen to consist of a sheath of amnion containing two arteries and a vein, which are embedded in a supporting medium of mucoid tissue. This (the jelly of Wharton) is a product of the deeper layer (next the chorion) of the amnion (see figs. 18, 19, 20). It is, therefore, really a part of the amnion itself, and that is the reason why the amnion cannot be stripped off the cord as it can off the placental surface. The jelly ends abruptly at the chorionic surface, as is seen in fig. 21.

Fig. 33.—Umbilical artery in fig. 32.

The vessels of the cord are three in number, two arteries and a vein. The latter is, when empty, more or less collapsed, but the former retain their tubular appearance, owing to their thicker walls. The arteries are branches of the internal iliac, and in the abdomen are named the hypogastric arteries. The vein is formed by the fusion of the original pair of umbilical veins. This fusion occurs in the very early days of the development of the embryo as far as that part of the veins which lies in the cord is concerned; but the

[1] Or it may be caused by more rapid growth of one or more of the vessels, *e.g.* the arteries, than the rest.

two vessels remain distinct in the abdomen till much later, and then they do not fuse, but the right one is obliterated.

There are no valves in the vein. In the arteries there are numerous dilatations, which can be seen externally, giving rise to bluish knots, to be found in every cord. There is thickening of the walls of the arteries at these points, and the condition is no doubt connected with the twisting of the cord, and is produced by local damage.

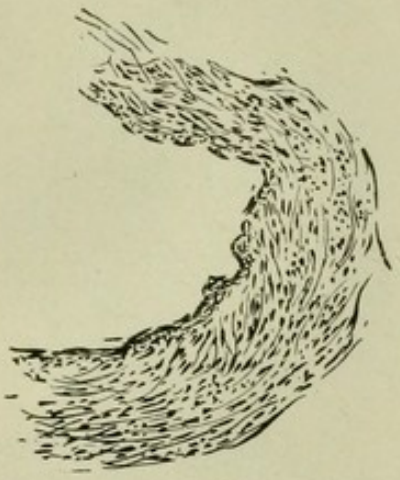

Fig. 34.—Section through wall of umbilical vein.

The arteries have very thick muscular walls (fig. 33), but have no elastic layer.

The vein has no valves. It is dilated at intervals in its length.

The remains of the allantois are not distinguishable in the cord; but in the abdomen this organ is represented by the urachus and the bladder.

In the earlier months a loop of intestine is found in the sheath of the cord, extending for half an inch or so into the tube. This is the part of the small intestine to which the umbilical duct is attached. It is withdrawn into the abdomen about the beginning of the third month, when the umbilicus closes.

Physiology of the Placenta.—The placenta forms the means by which the blood of the fœtus is brought into apposition with that of the mother. The anatomy of the fœtal and maternal parts of this organ has been sufficiently described for it to be seen how close the apposition is. Between the maternal blood, fresh from the lungs, and fully oxygenated, and that of the child, which is carbonised, there is a very thin layer of tissue. This layer is composed of, (*a*) the epithelium covering the surface of the villi, (*b*) a varying amount of the tissue of the villus itself, and (*c*) the vessel-wall of the terminal twig of the artery belonging to the villus.

Through this diaphragm the two currents interchange their gases and soluble substances by diffusion and osmosis.

The placenta is at once the lung, the alimentary apparatus, and the kidney of the fœtus.

The child parts with its carbonic acid gas, which is taken up by the maternal blood, and receives in return the small amount of oxygen necessary for its chemistry; it passes over its waste-products and receives the materials for its nutrition. Experiments have been made showing that there is a certain amount of selective power in the partition between the two bloods, and this power lies, most probably, in the epithelial layers.

Varieties of Shape, Structure, &c., in the Normal Placenta, Cord, and Membranes

Placenta. (*a*) *Shape.*—The placenta is usually composed of one lobe[1] only; but it may be divided more or less completely into two or more lobes.

[1] A lobe is a term of convenience, and has no meaning in the sense that 'cotyledon' has.

The main variations in the shape of the single-lobed placenta are that its outline may be roughly circular ; it may be oval ; or it may be of irregular shape.

The existence of two or more lobes is less common. These may be of nearly equal size, or one may be larger than the other, or others. They may be united by placental tissue ; or may be quite separate, and the lobes are then united by a bridge of the three membranes of the ovum, in which the chorion is devoid of fully-developed villi.

The placenta of this last class is of obstetric importance when one lobe forms the main mass of the organ, and is large enough to be regarded on superficial examination as the whole placenta ; for during the process of its detachment from the uterus during labour, the small lobe, or lobes, if more than one exist, may be left attached to the uterine wall, and may not be

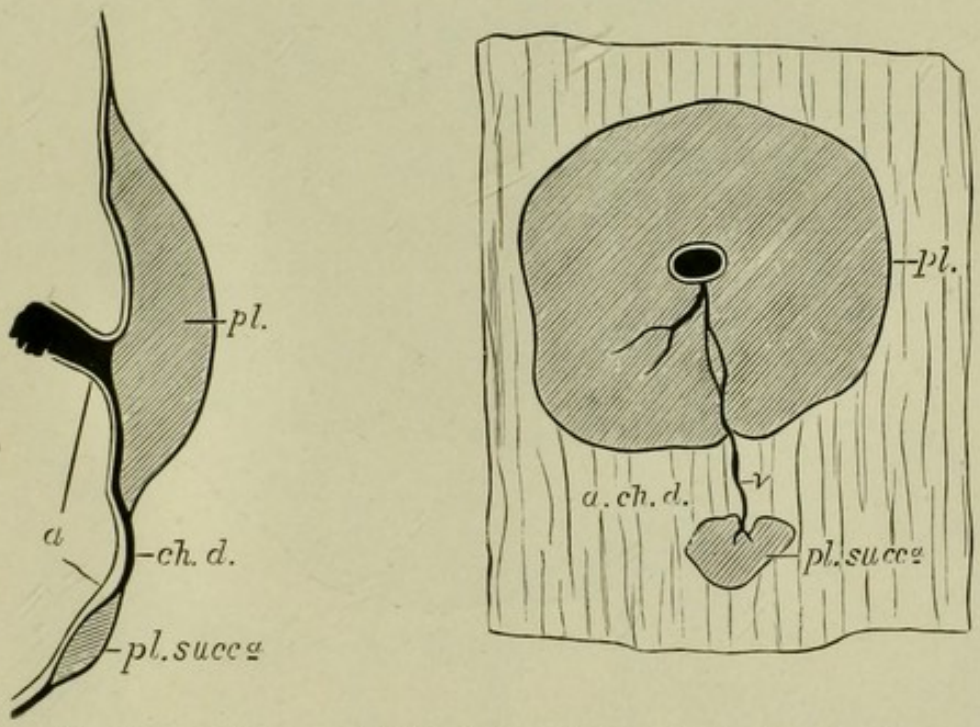

Fig. 35.—Placenta succenturiata. *Pl*, placenta ; *a. ch. d*, amnion, chorion, decidua ; *v*, vessels ; *pl. succ^a*, placenta succenturiata.

missed by the physician. Such retention of a part of the placenta will, in all probability, lead to dangerous results later. The small lobes, separate from the main mass of the placenta, are named Placentæ succenturiatæ (fig. 35).

On examining a placenta in connection with which a placenta succenturiata has existed, but is torn off, it will be seen that at some part of the edge of the main mass there are two vessels torn through, which have supplied the small lobe with blood. If the membranes have been delivered entire, it will be found that at the spot where the small lobe existed there is only a layer of amnion, the chorion and decidua being absent, or there may be some traces of the villi still adherent to the surface. If the membranes are torn away from the edge of the main mass, there will be no evidence of the succenturiate placenta but the torn vessels.

Placenta with 'collerette' (fig. 36). This consists of a doubling back of the amnion at the edge of the placenta, so as to form a kind of pouch. The

collerette may extend all round the circumference of the placenta, or it may, as in the specimen figured, only exist on about two-thirds of its circumference. It is not very uncommon, and the amount of freedom of the double layer of amnion varies considerably in different cases. It is probably due to a more rapid growth of the villous part of the chorion than the membranous part

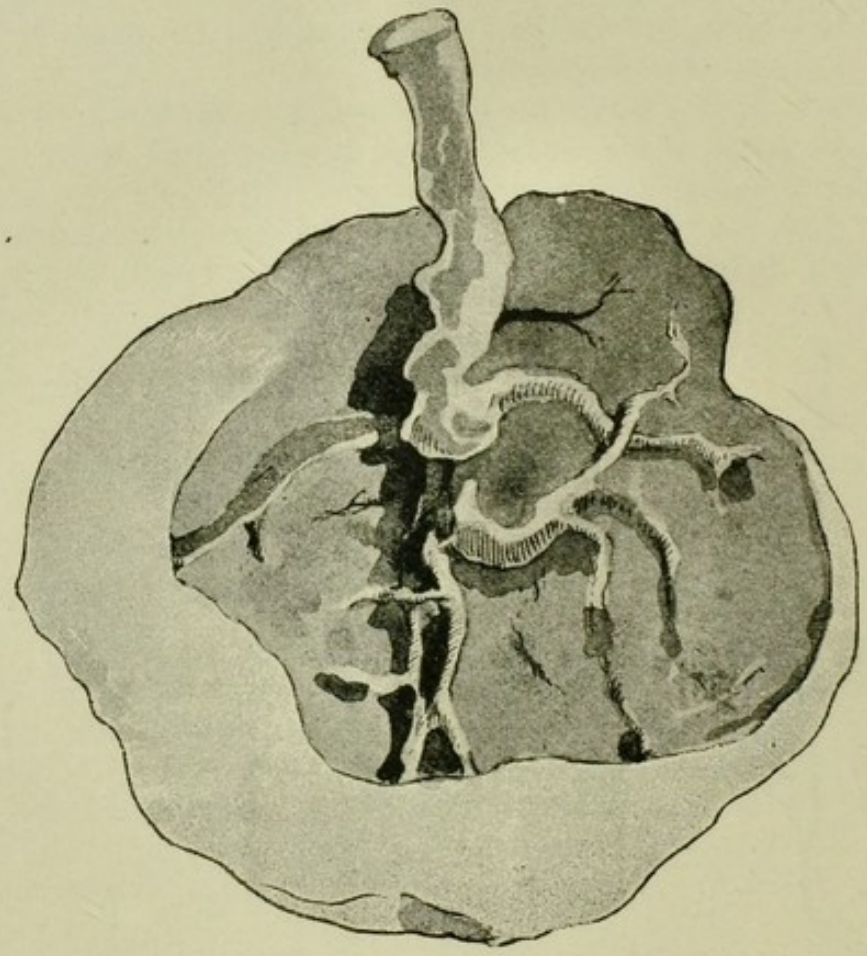

Fig. 36.—Placenta with 'collerette.'

and the amnion can keep up with ; the two layers are in consequence overlapped by the villi, and are inverted, as will be readily understood from the diagram of a section of the same placenta.[1] The vessels on the surface of the placenta are seen in the figure to disappear beneath the free edge (fig. 36).

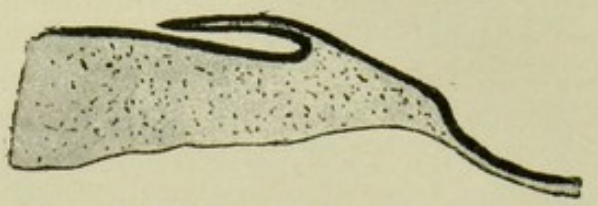

Fig. 37.—Section through amnionic fold at edge of placenta of fig. 36.

(*b*) *Structure.*—The varieties in structure occur almost entirely in connection with the vessels. These may be erratic in their course ; they may be thrombosed (the smaller ones) ; they may present local dilatations, or they may be the seat of calcareous deposit.

Other irregularities in structure found in placentæ which come from perfectly normal ova are the presence of cysts, of extravasations, of fibrous masses

Erratic Vessels.—A vessel is sometimes found to run over the edge of the placenta on to the membranes, form a loop on the surface of the chorion,

[1] This condition is well described by Auvard (*Travaux d'Obstetrique*, t. 2ième).

beneath the amnion, and then to return to the placental surface and distribute itself in the usual way. This may occur in a placenta whose outline is of the circular or oval type, when the errant vessel describes a curve around the edge of the placenta at a variable distance from its edge; or the vessel may bridge across some notch in, for instance, a bi-lobed placenta (fig. 38).

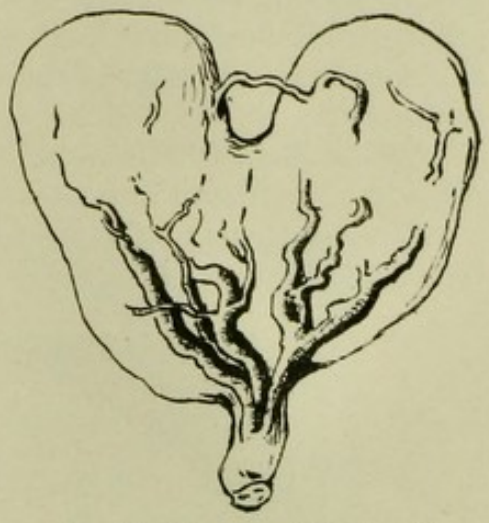

Fig. 38.—Placenta, bilobed, with errant vessel.

The condition is not in itself of any importance, but it may lead to undesirable consequences in two ways. If the vessel happen to lie in that part of the membranes covering the internal os during dilation of the cervix, it may be ruptured at the time of rupture of the membranes, and bleeding dangerous or fatal to the child result; or if the torn end of such a vessel is found at the margin of the placenta when this is examined after labour, it might give the impression that a placenta succenturiata had existed, and, failing to find this attached anywhere on the membranes, the medical man might explore and unnecessarily manipulate the interior of the uterus. The way to avoid this unnecessary disturbance of

Fig. 39.—Dilated artery just by insertion of cord.

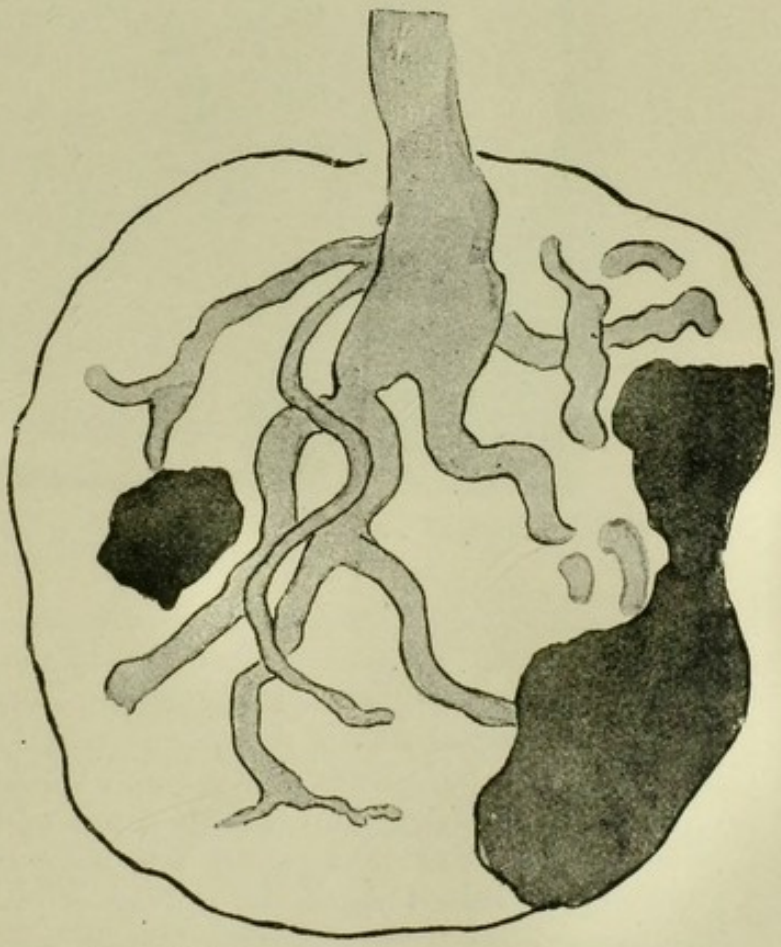

Fig. 40.—Fibrous masses, represented by shaded areas, in a normal placenta.

the woman is to notice whether there are two vessels torn across or only one. If there is only one, that is either an artery or a vein alone, the vessel is an erratic one, and the edge of the placenta, if followed round, will show the other end of the errant part of the vessel. If, however, there has been a succenturiate placenta at the end of the torn vessel, there will be an artery and a vein.

Dilatations of Vessels.—The vessels, either arteries or vein, may be found considerably dilated into aneurysmal-looking sacs (fig. 39).

Fibrous Masses.—On the fœtal surface of almost every placenta are found plaques, or lumps, of tissue of areas varying from that of a threepenny bit or

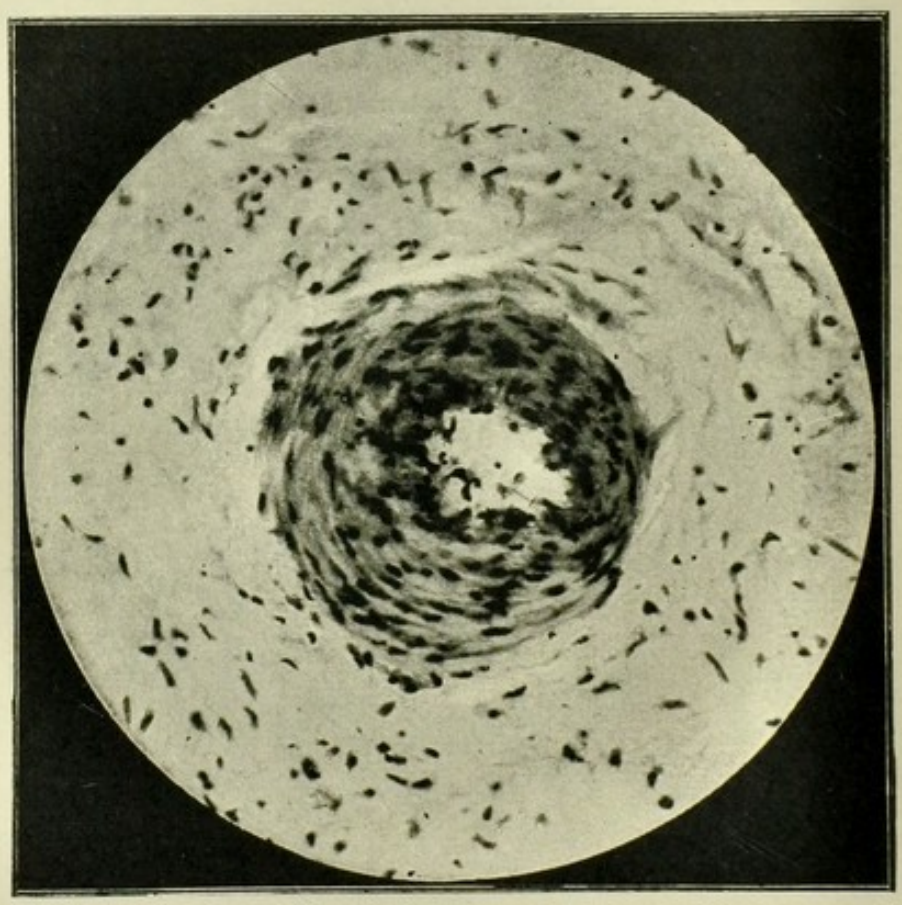

Fig. 41.—Artery of a villus, in an early stage of endarteritis, showing also thickening of the muscular coat (Eden).

less to such as are of sufficient size in rarer cases to occupy a third or so of the surface, as in fig. 40. These lumps lie immediately beneath the amnion, to which they are nearly always inseparably united, and are of a lighter colour and a much denser texture than the placental tissue proper. They dip down into the placental substance to a depth varying from one-eighth of an inch or so to one involving the whole thickness of the placenta. They have been called by various names by those who have seen them for the first time—gummata, organised blood-clot, patches of placentitis, fibromata, sarcomata. They are infarcts due to thrombosis of villous arteries (fig. 41). Many of these in the later months become thick by proliferation of their intima, which may occlude the channel. Microscopically the masses consist of compressed and necrosing villi (fig. 41 A).[1]

[1] See a paper by Eden 'On the Structure of the Ripe Placenta, &c.,' *Obst. Trans.* vol. xxxviii.

They are found in the course of a vessel, and sometimes contain cysts, with thin walls as a rule, and holding a pale, turbid, watery fluid. Occasionally the cysts are found to contain a portion of partially or totally decolourised clot in addition to the serous fluid. Even when of large size, they are perfectly consistent with an entirely healthy placenta and fœtus.

Calcification of Decidua.—If the maternal surface of any placenta at term, or even a few weeks before term, be examined, there will be seen to

Fig. 41 A.—Section through the edge of an infarct. The villi on the left of the section are seen to be compressed and atrophied. On the right there is no trace of villi, and the dense white fibrinous material alone is present.

be thinly scattered over it superficial dendritic deposits of white, hard material. These are small portions of calcified decidua.

Cysts.—The formation of cysts in connection with fibrous masses has been alluded to, and in all probability this is the commonest way in which they are produced. Cysts have been described which were considered of a myxomatous nature ; but this opinion was probably founded on an imperfect acquaintance with the normal histology of the placenta.

Cord. (*a*) *Insertion* (see figs. 42–45).—The cord may be inserted into the placenta at the centre, or somewhere near it—the usual place ; or it may be near one edge, and the insertion is then a lateral one. It may join the placenta at its edge, marginal insertion, 'battledore placenta ;' or it may end on the membranes at a distance of one, two, three, or more inches from

the edge of the placenta. This last is called an 'insertio velamentosa.' In the case of velamentous insertion, the vessels may remain together and unbranched till they reach the surface of the placenta, or they may begin to divide on the membranes and reach the edge by numerous branches. In this case, as in that where there is an erratic vessel, there might be some danger of rupture of vessels during labour if the branches crossed the internal os.

(*b*) *Structure. Knots.*—During the free movements of the fœtus in utero in the earlier months the fœtus may float through a loop of the cord, and thus form a knot in it. If this is drawn tight in labour, the vessels may be occluded.

Nodosities.—These are to be seen in most cords, and the lumps are

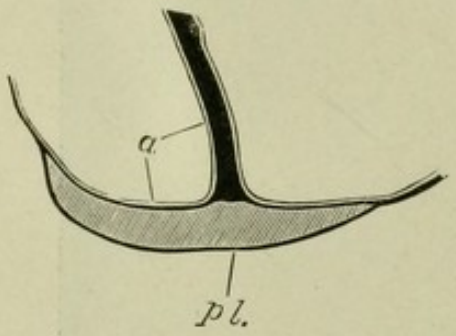

Fig. 42.—Central insertion. *a*, amnion; *pl*, placenta.

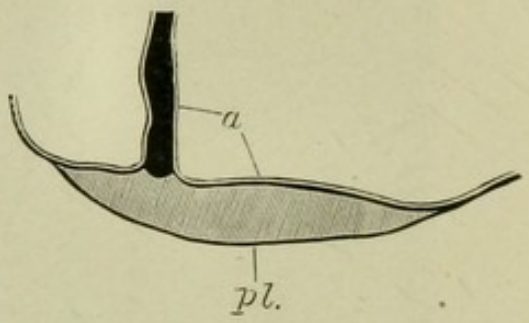

Fig. 43.—Lateral insertion. *a*, amnion; *pl*, placenta.

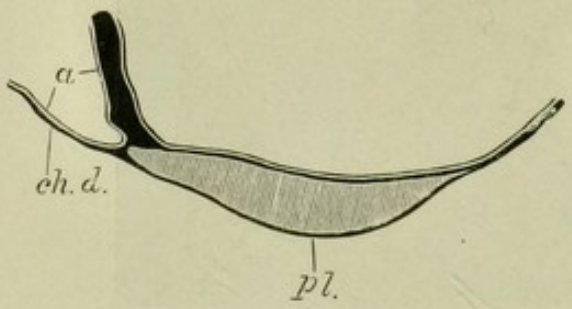

Fig. 44.—Marginal insertion. *a*, amnion; *pl*, placenta; *ch. d*, chorion and decidua.

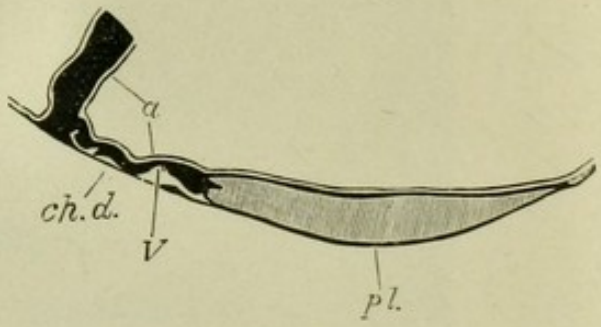

Fig. 45.—Velamentous insertion. *a*, amnion; *pl*, placenta; *ch. d*, chorion and decidua; *v*, vessels.

sometimes twice, or more than twice, the diameter of the cord elsewhere. The thickening is mostly composed of a collection of Wharton's jelly at that spot, but on examination of the vessels they will also be found to be thickened as to their coats, and this change in all the specimens examined by the author has affected the arteries and not the vein. It is very likely caused by a kink in the cord from over-twisting, which has damaged the vessels but has not occluded them.

Cysts.—These have been recorded. They may be owing to persistence of the cavity of the allantois at one spot, and in that case are developmental errors; or they may be local softenings of the jelly, caused by twisting and damage. This subject has not been worked out.

Membranes.—Fibrous masses are found occasionally in the membranes at variable distances from the edge of the placenta. They have no doubt

the same origin as those on the placenta, for islands of undeveloped and unatrophied villi are sometimes found.

There is sometimes a space containing fluid between the amnion and the chorion. On looking at the diagrams of the development of the ovum, it will be seen that this fluid lies in the space between the 'true' and 'false' amnion (the pleuro-peritoneal space, cœlom). It is thus due to the persistence of a space that should have disappeared. It may cause some confusion by the appearance of a double bag of membranes during labour (p. 114).

Liquor Amnii.—The only normal variation in this, apart from variation in the quantity (see p. 19), is its occasional discolouration. It is then of a dark olive tint, more or less muddy. This may be due to evacuation of meconium by the child during pregnancy. Evacuation of meconium during labour often means that the child is in danger from asphyxia, but not always, and it has been found to occur in a large number of instances in perfectly normal cases.

CHAPTER III

THE OVUM AT DIFFERENT PERIODS OF PREGNANCY

First month.—There are a number of ova figured and described which are believed to be something under a month in age; but, as far as any practical importance exists in recognising the age of embryoes so early as this, it will be served by a general description of the ovum about the end of the month.

The ovum measures roughly one inch in diameter, and the embryo when straightened out about half an inch. The chorion is covered with villi, and has the appearance of fine seaweed when the ovum is floated in water (fig. 46).

The amnion does not quite fill the cavity of the chorion, and is separated from that membrane by a space containing clear fluid.

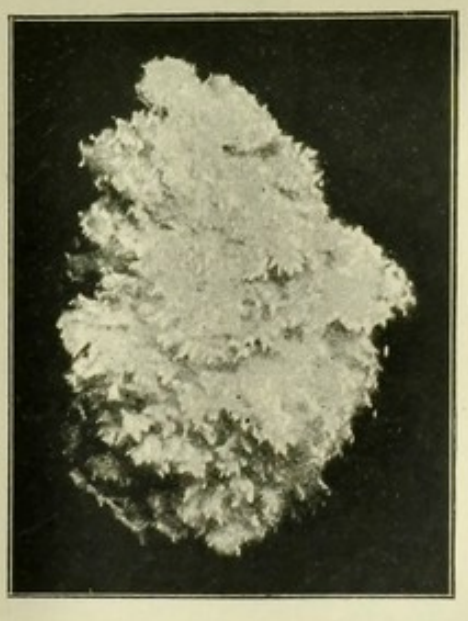

Fig. 46.—Ovum of about the fifth week.

Second month.—At the end of this month the ovum is nearly two inches in diameter, and the embryo rather over three-quarters of an inch in length.

The amnion fills the chorion; the umbilical vesicle has shrivelled down to little more than the size of a pea, and has a long pedicle; the villi are

disappearing off the greater part of the chorionic surface; the umbilical cord is not yet twisted, and contains a loop of intestine in its base (fig. 46 A).

Third month.—At the twelfth week the ovum is about four inches in its long diameter, and the fœtus or embryo (as it may be indifferently called at this moment) is about four inches long also, and may be compared in point of size to a mouse.

The placenta is quite distinct, and the rest of the chorion is practically clear of villi. The cord has begun to twist, and the coil of intestine is about now withdrawn from its base.

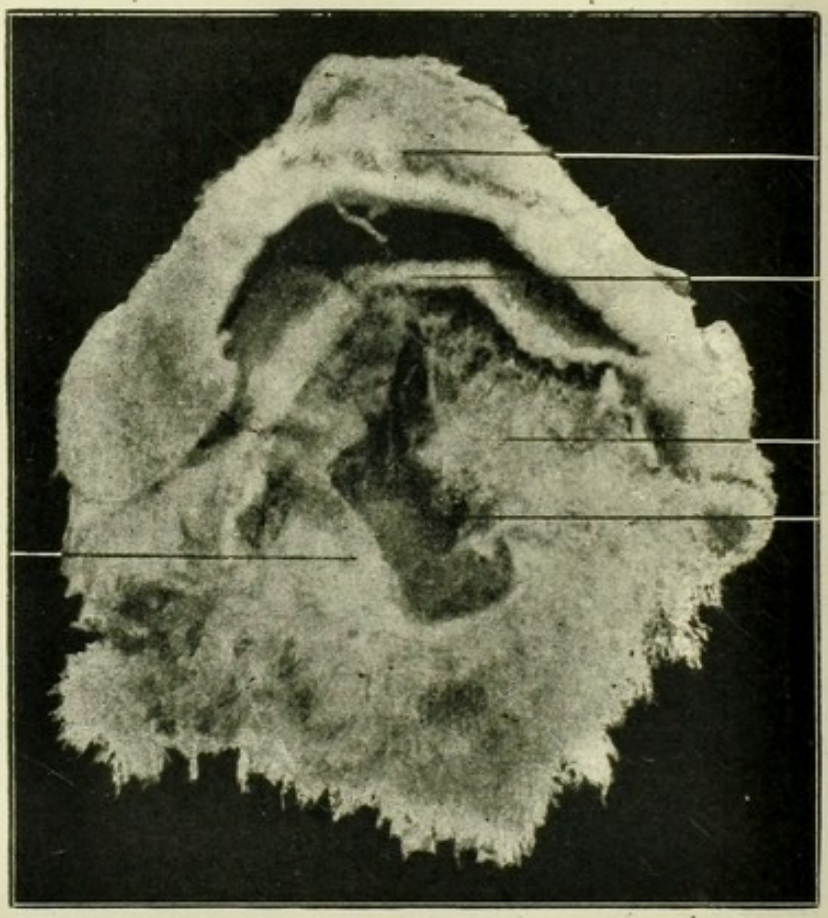

Fig. 46 A.—Ovum of seven to eight weeks. *D V*, decidua vera; *D R*, decidua reflexa *Ch*, chorion; *Am*, amnion. Through the amnion the embryo can be indistinctly seen.

Fourth month.—The fœtus is now five to six inches long or more, and its body is about the size of a moderately grown rat. The head is proportionately very large. The sexes can be distinguished.

Seventh month.—The length of the fœtus is now about 15 inches, and its weight about 3 lb. A child born at the end of this month may live if it is strong and carefully tended. The large majority of children born at this time, however, die. The nails do not reach the finger-tips.

At the end of the **ninth calendar month**, or **full term**, the child is, on an average, 20 inches long and weighs 7 lb.

Other points indicating maturity are : the body is plump, and of a colour a little redder than that of the parts of an adult's skin which are usually covered ; the lanugo, a fine down which covers the body of the fœtus of the earlier months, has almost disappeared ; the nails project beyond the tips of the fingers, and those of the toes just reach their ends ; both testes can be felt in the scrotum, which has its normal corrugated appearance. The head is large in proportion to the body still, but this is not so marked as in the earlier months ; the edges of the sutures are close together and the bones are firm. The head is usually covered with hair an

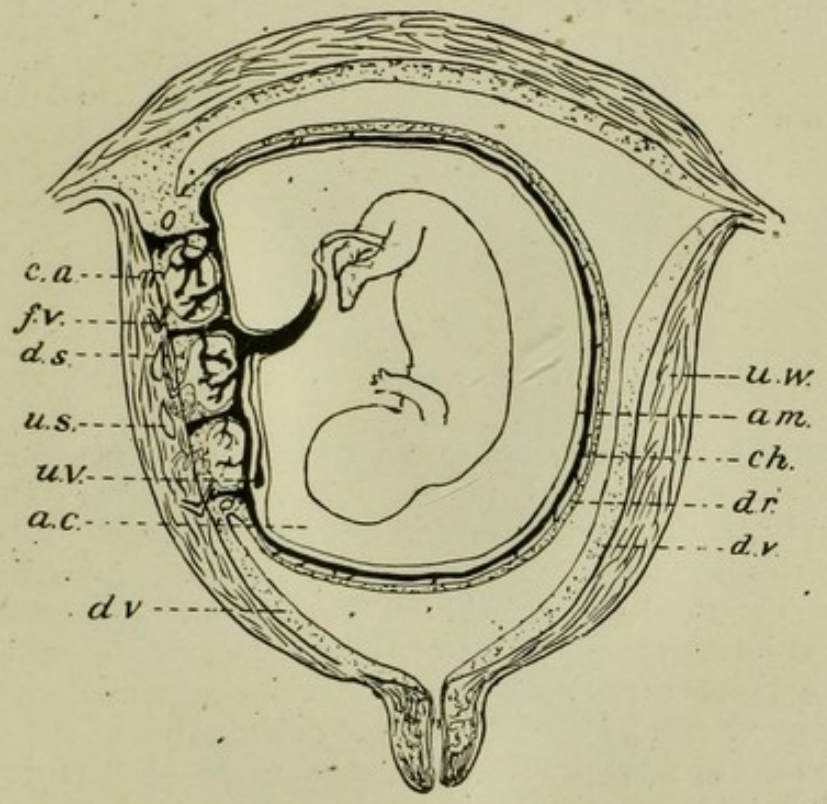

Fig. 47.—Diagram of uterus at three to four months. *u w*, uterine wall ; *d v*, decidua vera ; *d r*, decidua reflexa ; *d s*, decidua serotina ; *am*, amnion ; *ch*, chorion ; *a c*, amnionic cavity ; *u s*, uterine sinus ; *f v*, falciform valve ; *c a*, curling artery.

inch or so in length. The body is smeared over with a sebaceous material, the *Vernix caseosa*.

The child cries loudly after birth, and within a few hours passes urine and meconium. (For composition of meconium, see p. 238.) Sucking movements are made if the finger is introduced into the child's mouth.

Varieties in Weight.—The children of large parents are often large, but this rule is not by any means universal. Two important factors governing small variations in the size of the child are the age of the woman and the sex of the child. The practical bearing of these will be discussed later (p. 440), but it may be remembered that male children have, as a rule, more fully ossified and therefore less compressible heads, and that if the woman has borne children before the age of twenty-five, those children which succeed them and are born between the ages of twenty-five and thirty-five are larger ; whereas those born after thirty-five are, as a rule,

again of about the same weight and size as the earlier ones. A woman, in fact, has the best developed children between twenty-five and thirty-five.

The proportion of male to female children born in the General Lying-in Hospital during two years was 547 males to 545 females in 1,092 births.

Children are sometimes born which exceed the average weight and size to a remarkable degree. Fœtuses of 18 lb., 16½ lb., and so forth are recorded.[1]

The measurements and anatomy of the fœtus, and especially of its head, as far as these subjects are of importance in labour, are described at p. 90.

The circulation peculiar to the fœtus is also dealt with in a later section, as it will be more convenient to describe this and the changes in it which occur at birth together.

CHAPTER IV

ATTITUDES AND MECHANICAL RELATIONS OF THE FŒTUS IN UTERO

Lie, Attitude, and Position of the Fœtus in Utero.—To prevent the confusion which often arises in the use of the terms '*lie*,' '*attitude*,' '*position*,' and '*presentation*,' these will now be defined.

Lie.—By this is meant the relation of the long axis of the child to that of the mother. The child may lie with its long axis approximately in that of the mother, or its long axis may be at right angles, or something near it, to hers. In the former case the lie is said to be a *longitudinal* one, and in the latter a *transverse* one. Further, the head or the pelvis of the child may be below in the case of a longitudinal lie : then, if the head is downward, the child is in the *cephalic lie* ; if the breech is downward, the lie is said to be *pelvic* (see figs. 56 and 48).

Attitude.—This refers to the relations which the trunk, head, and limbs of the child have to one another, quite independently of the relations of any part of the fœtus to any part of the mother. Thus the child may be in a *flexed* attitude, with the head flexed on the trunk, the thighs flexed on the abdomen, and the legs on the thighs ; or it may be *extended*, with the occiput in contact with the back, possibly with the thighs extended on the trunk, and the legs on the thighs ; or the head, or trunk, or both may be bent to one side (lateriflexion), or one or more limbs may be extended (see figs. 142, 143).

Position.—This, in obstetrics, is used to indicate the relation of a given surface of the fœtus, usually the back, to the anterior, posterior, or lateral aspects of the mother. The antero-posterior diameter of that part of the child which is under consideration, say the head, may be considered as the needle of a compass, and the pelvis of the mother the compass card. The head may be in such a position that this diameter lies with its posterior pole

[1] Wolff, *Berl. Klin. Wochen.* 1878, p. 620, and *ibid.* p. 648 ; quoted by Spiegelberg.

looking to the front (occipito-anterior), to the side (head transverse), or to the back (occipito-posterior), of the pelvis, or to some other point on the circle of the pelvic circumference (see figs. 146 and 147). In fact, the position of the head might be called its orientation.[1]

The term *presentation* is often used as synonymous with lie, but this is a mistake. The presentation means that part which is first touched by an examining finger at any time while the head is descending through the parturient canal. Now the fœtus may be in the cephalic lie, and may then present by the vertex, or by the face, or by an intermediate part of the head;

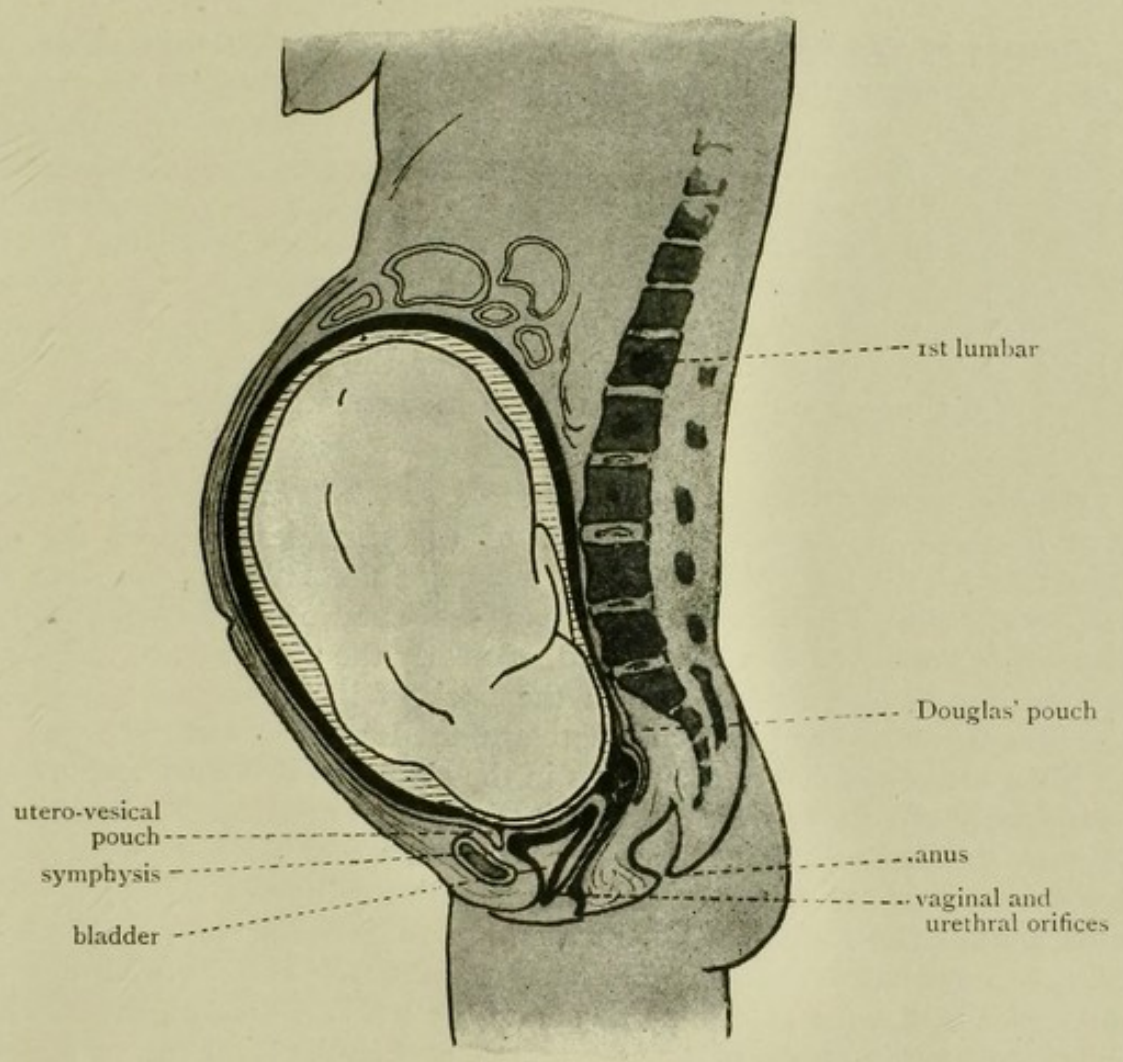

Fig. 48.—Uterus at term.

that is, the vertex, face, or other part may be the one which descends first through the parturient canal, and would be first felt of any part of the child by a finger entering the vagina.

So, too, in the case of a pelvic lie the presenting part, or presentation, may be the breech or may be the feet, and in a transverse lie the shoulder or the elbow may be the presenting part.

[1] A term used by some French obstetric authors, in analogy with the term indicating the direction of a line on a map or chart.

The word *presentation* should be restricted to mean that part of the fœtal head (or breech or limbs, as the case may be) which is 'felt most prominently within the circle of the os uteri, the vagina, and the ostium vaginæ, in the successive stages of labour' (Tyler Smith), or 'that point on the surface of the child's head through which the axis of the fully developed pelvic canal passes' (Matthews Duncan).

The description of the lie, attitude, &c., in which the child is most often found at term (see First Cranial Position, p. 141) (fig. 48) would be: Lie, cephalic; Attitude, that of flexion; Position, left occipito-anterior; Presentation, vertex.

Causes of the Prevalence of certain Lies and Positions at Term.—The most common position for the child to assume is the first vertex—the one just described. Cephalic lies are found in about 96 per cent. of all cases, and of these about 75 per cent. are in the first, or occipito-anterior, position, with the occiput to the left.

The reason for this preponderance is not absolutely settled. It is no doubt a complex one, and comprises more than one factor.

There are three conditions each of which has some influence. They are: (1) the position of the centre of gravity of the fœtus; (2) the relative shapes of the uterus and of the fœtus; (3) movements of the fœtus.

(1) Matthews Duncan found that the *centre of gravity of the fœtus at term* lay somewhere about the level of the shoulders, nearer the right shoulder than the left owing to the presence of the liver on the right side, and nearer the posterior surface than the anterior. Consequently, if a fœtus were immersed in a saline fluid of nearly the same specific gravity as its own, it sank into a position with the back of its right shoulder looking downwards. The head became, therefore, the lowest part of the body.

Now, if the position of the uterus in the abdomen is considered, it will be seen that, if the fœtus were unrestrained in its movements, the first vertex position is nearly the one which it would assume at term. The uterus is inclined forwards to an angle of about 60° with the horizon when the woman is in an upright attitude, and, in addition to this, its anterior surface is rotated somewhat to the right (see figs. 51 and 64). The result of these two obliquities is that the anterior surface and the left border of the lower uterine segment form the lowest part of the uterus, and so the head-end of the child tends to fall into this part with its back to the left and forwards. Flexion is the natural attitude of the embryo at the beginning of its development, and extension is always due to some abnormal condition. The vertex is thus the lowest part of the head.

(2) *Shape of the Uterus and the Fœtal Ovoid.*—The uterine cavity forms an ovoid with its wider end at the fundus, and the fœtal ovoid is widest at the breech (see figs. 48 and 102); the breech therefore tends to lie in the fundal end of the uterus. This is well demonstrated by the fact that in the case of a hydrocephalic fœtus, in which the head-end of the child is the larger, the podalic lie is much commoner than is the case of normal fœtuses (see fig. 206).

In addition to the actual shape of the uterus when undisturbed by external pressure, it must be remembered that while it is relaxed, and when the woman is lying on her back especially—though the same effect is produced in a lesser degree by the backward pressure of the anterior muscular abdominal walls—the posterior uterine wall is convex inwards, owing to the projection forwards of the lumbar spine (see fig. 51). The child, which, owing to its flexed attitude, has a bent axis, with the concavity on its anterior aspect, fits best to the shape of the uterine cavity when it has its back to the mother's front. It assumes a position under these circumstances with its back to the left (specific gravity) and forwards (lumbar spine).

(3) *Movements of the Fœtus in Utero.*—The child is often felt by the mother and by the hand of the medical man to move its limbs; and the legs, acting at the end of the body-lever, will have great effect in bringing about changes of lie and position. They also are actually more vigorous in their movements than the arms. Supposing the child to lie with its feet downwards, it will have the resisting pelvic brim, or some part of the pelvis, to kick against, and every kick will tend to displace the legs upwards. When the child has kicked itself into a transverse lie, the shape of the uterus will then tend to convert the lie into a longitudinal one, either cephalic or back again into the podalic. The lie will not long remain podalic on account of the movements of the legs, which again convert it into a transverse one. If, however, the fœtus is forced by the uterus into the cephalic lie, there is no reason why it should not remain in it, for there is now no resisting object against which the legs can take effect, as the fundus yields readily. In addition, the action of specific gravity and the shape of the uterus tend to keep the child in the cephalic lie.

In further support of the above considerations, it may be mentioned that in the case of premature children, where not only does the child not fit the uterus at all closely (fig. 56, p. 40), but in which it is found also that the specific gravity is not greater towards the cephalic end of the fœtus, the podalic lie is much more common in proportion than in children which have reached term. The podalic lie is commoner than usual where the child is dead, even when it is at or near term; and in this case it is most likely due to the absence of movements on the part of the child.

CHAPTER V

CHANGES IN THE MATERNAL ORGANISM

THE changes in the maternal organism which take place during pregnancy may be divided into two sections: (*a*) those which occur in the generative organs and their immediate neighbourhood; and (*b*) those which occur in the general physiology and anatomy of the woman.

(*a*) Changes in the Generative Organs and in their Neighbourhood, including the Breasts

The alteration in function of the generative organs, which consists in the suppression of menstruation, will be best dealt with in the chapter on the Diagnosis of Pregnancy (p. 58); those about to be considered are mainly anatomical ones.

Uterus

The most obvious change in the uterus is that which takes place in its size and shape.

The *increase in size* takes place in the body of the uterus; the cervix is not much, if at all, enlarged. The cavity of the body increases in length from 1½ inch—its length in the unimpregnated state—to about 12 inches; in width from 1¼ inch to about 9 inches; and in depth from practically nothing to about 8 or 9 inches. Its cubic capacity is enlarged from one of theoretically none to about 500 cubic inches, and its weight (of the entire uterus), instead of being about 1 ounce, increases to about 24 ounces.

Farre and Tanner give the following figures:—

	Length	Width	Depth
End of 3rd month	4½ to 5	4	3
„ 4th „	5½ to 6	5	4
„ 5th „	6 to 7	5½	5
„ 6th „	8 to 9	6½	6
„ 7th „	10 to 11	7½	6½
„ 8th „	11 to 12	8	7
„ 9th „	12 to 14	9½	8 to 9

There is a certain amount of variation possible in these measurements, due to the varying size of the fœtus and amount of liquor amnii in different cases. The uterus is larger also in the case of multiple pregnancy at any given date than the above measurements indicate.

This increase in all dimensions is a growth, and is not a result of mere distension. In the early months the uterine cavity grows rather faster than the ovum, and at the same time the walls grow thicker. Later on the cavity is filled by the ovum, but there is little tension exercised on its contents as long as the organ remains relaxed, for the outlines of the child can readily be felt in a relaxed uterus up to the last moment of pregnancy. The walls are then somewhat thinner than they are in the earlier months, but this can hardly, for the reason mentioned, be due to forcible distension. In certain cases, too, the ovum becomes implanted elsewhere than in the cavity of the uterus—namely, in the tube (see 'Ectopic Gestation,' p. 313); and in such circumstances the uterus is found to go on growing up to the fourth month, or longer, of gestation, and to attain an equal degree of development with that of the uterus of normal pregnancy at this period.

The changes in shape in pregnancy are very characteristic.—In the early months—up to about the fourth, that is—the uterus modifies its outlines from those of the unimpregnated pyriform shape, flattened antero-posteriorly, to

those of a spherical body, in which the segment just above the cervix does not form a neck, but is part of the general sphere. During the next month or so it seems that in some cases, at all events, the lower part of the womb grows faster in width than the upper, so that the general outline is that

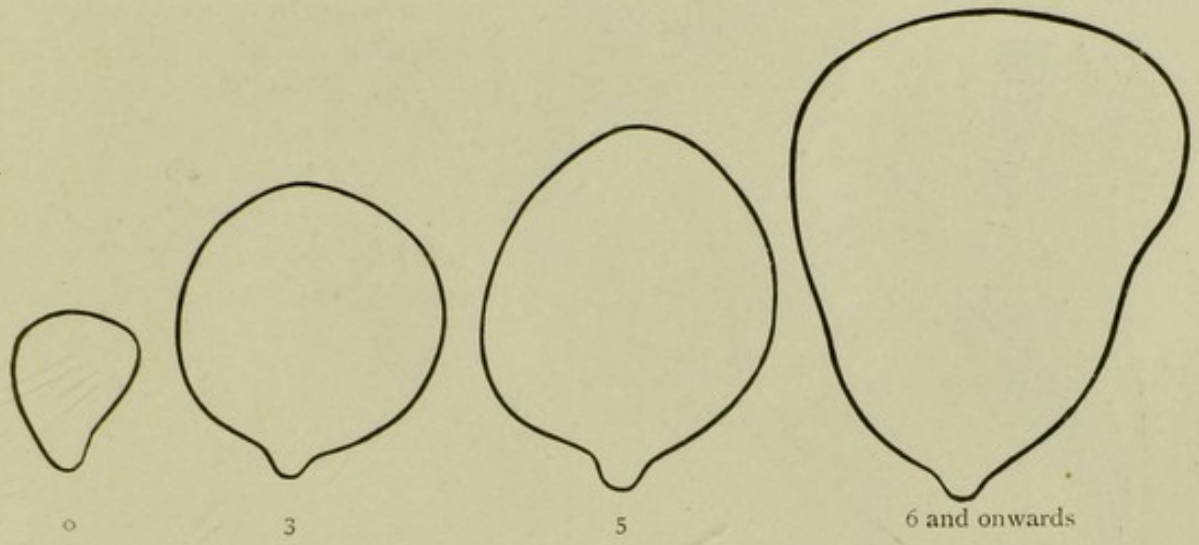

Fig. 49.—Shape of uterus at different months of pregnancy (after Webster).

of an inverted pear.[1] Towards the end of pregnancy there is no doubt that the uterus again comes to resemble in shape that of the unimpregnated organ, for although it is not so definitely pyriform, it is at least an ovoid with its

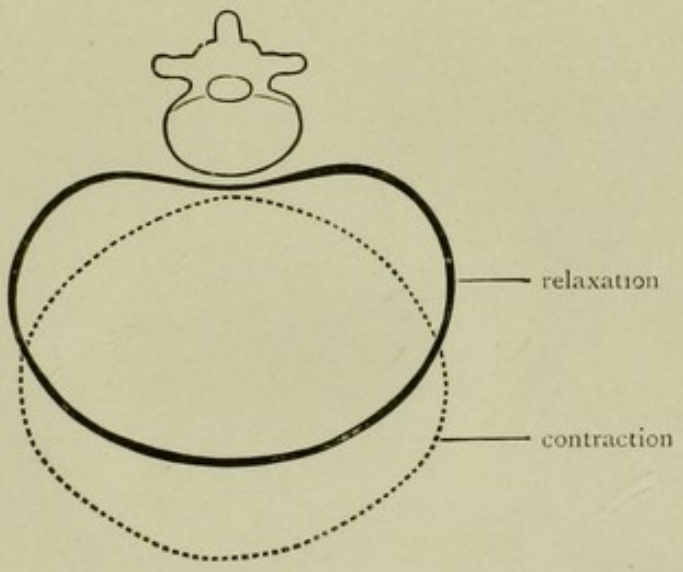

Fig. 50.—Horizontal section of spinal column and uterus.

wide end uppermost. The cervix attached to this body looks disproportionately small.

The shape of the uterus on transverse section is pretty circular during the earlier months, but later on it is modified while the organ is relaxed, by the projection forwards of the lumbar spine. (See chapter on Labour,

[1] In a section of Webster's, from whom the accompanying diagrams are copied, this was found to be the shape, though there may have been some modification due to the presence of a dermoid cyst of the ovary in Douglas's pouch. On measuring the relative width of the upper and lower parts of the cavity, he found that the latter was the wider.

p. 97). The uterus is kept in close contact with the posterior wall of the abdomen by the tone of the anterior abdominal wall both while the woman is in the erect position and when she lies on her back. In the latter position there is also the effect of gravity in the same direction. When the uterus is

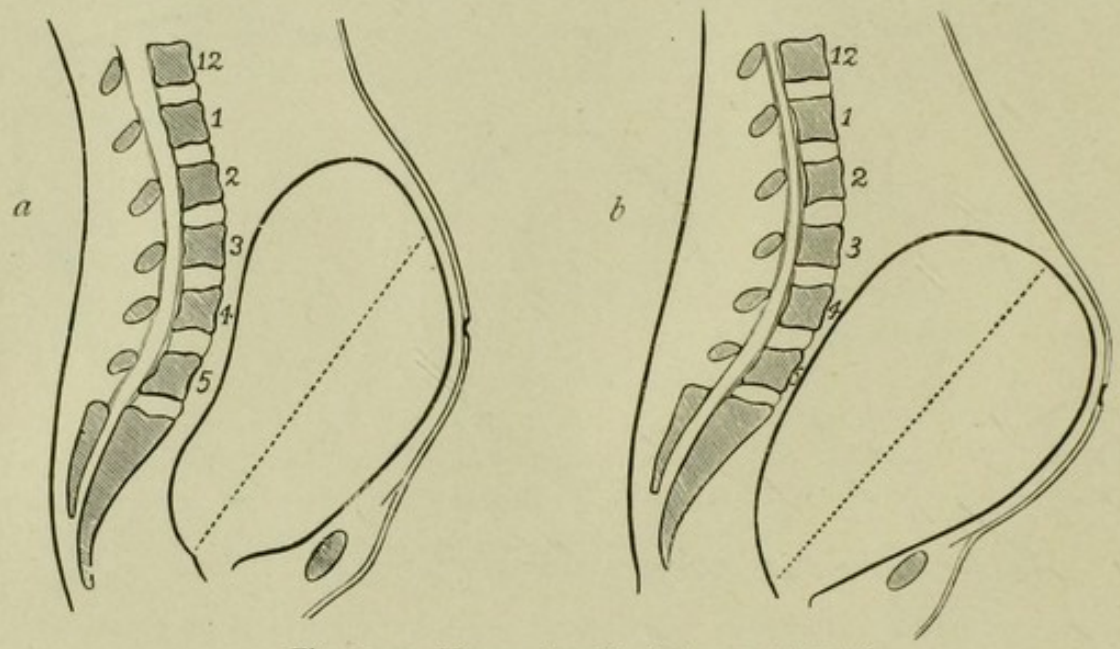

Fig. 51.—*a*, Uterus relaxed ; *b*, uterus contracted.

in a state of contraction, however, the tension produced on its contents is enough to cause the organ to resume its uniform ovoid shape, and to obliterate the depression caused by the projection forwards of the lumbar spine. This has the result that the uterus as a whole comes forwards in the abdomen, and then lies nearly in the axis of the pelvic inlet, and it can be felt by abdominal examination to so project during a contraction. (Figs. 50 and 51.)

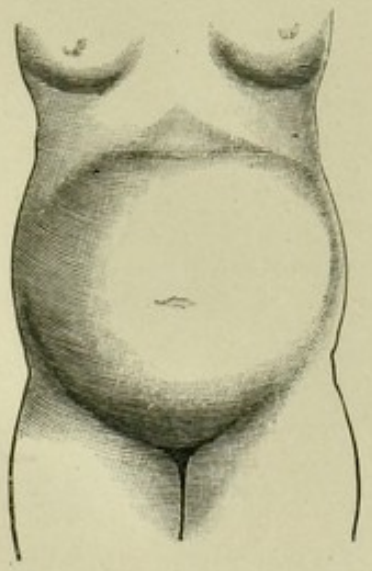

Fig. 52.—Shape of abdomen in case of arcuate uterus.

Uterine Contractions during pregnancy.—During the whole of pregnancy the uterus is in a state of alternate contraction and relaxation. In the later months this can be easily made out by abdominal examination, and, in fact, it may be felt to harden occasionally as soon as the fundus is accessible to examination from the abdominal surface. This contraction is not always caused by the stimulus of the examination, for the uterus may be found contracted when the hand is first laid on the abdomen, and will after a few moments be felt to relax. This character of the pregnant uterus is a most important one, and was first described by Braxton Hicks. It will be again alluded to in the chapter on Diagnosis of Pregnancy. The intermittent contractions are of some use during pregnancy, for by them the circulation in the placental sinuses is much assisted, and were it not for them it is possible that the heart's impulse would be unable to keep up a sufficient supply of fresh blood for the needs of the fœtus. The

uterus during a contraction is most commonly felt to have an outline of a fairly uniform ovoid; but in a certain proportion of cases the fundus is found to be divided into two lobes by a more or less obvious sulcus. The uterus then approaches the arcuate or cordate type (fig. 52, and see p. 293), and this modification of the curve of the fundus has been considered by some to be of importance in the production of certain presentations.

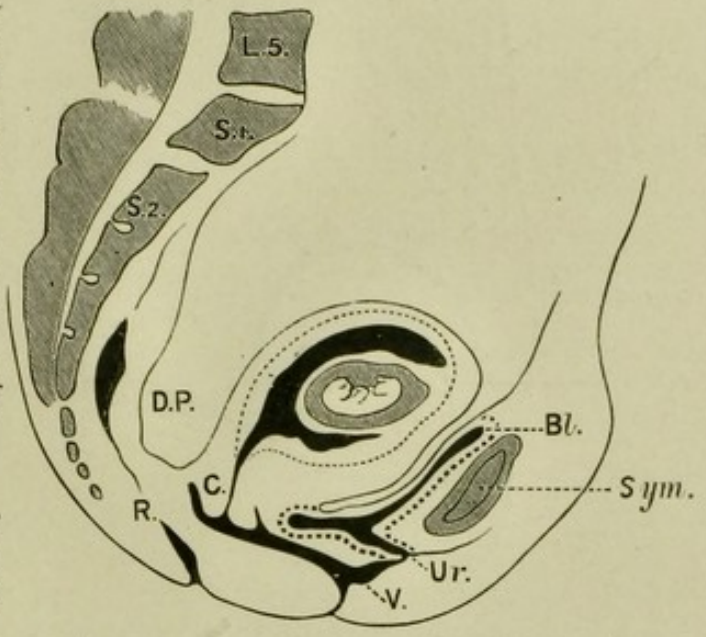

Fig. 53.—Section of pelvis about third month. (From a frozen section of Pinard and Varnier.) *D P*, Douglas' pouch; *R*, rectum; *C*, cervix uteri; *V*, vagina; *Ur*, urethra; *Bl*, bladder; *Sym*, symphysis; *L* 5, fifth lumbar vertebra; *S* 1, *S* 2, sacral vertebræ. The fine dotted line divides the decidua from the uterine muscle; the thick dotted line outlines the bladder.

Position of the Uterus in the Pelvis and Abdomen during pregnancy.—During the first two or three months the uterus, though larger and more globular, does not greatly change its level in the pelvis. Its increased weight may cause it to lie a little lower, but this effect is to a great extent counterbalanced by an increase of the normal anteflexion, also

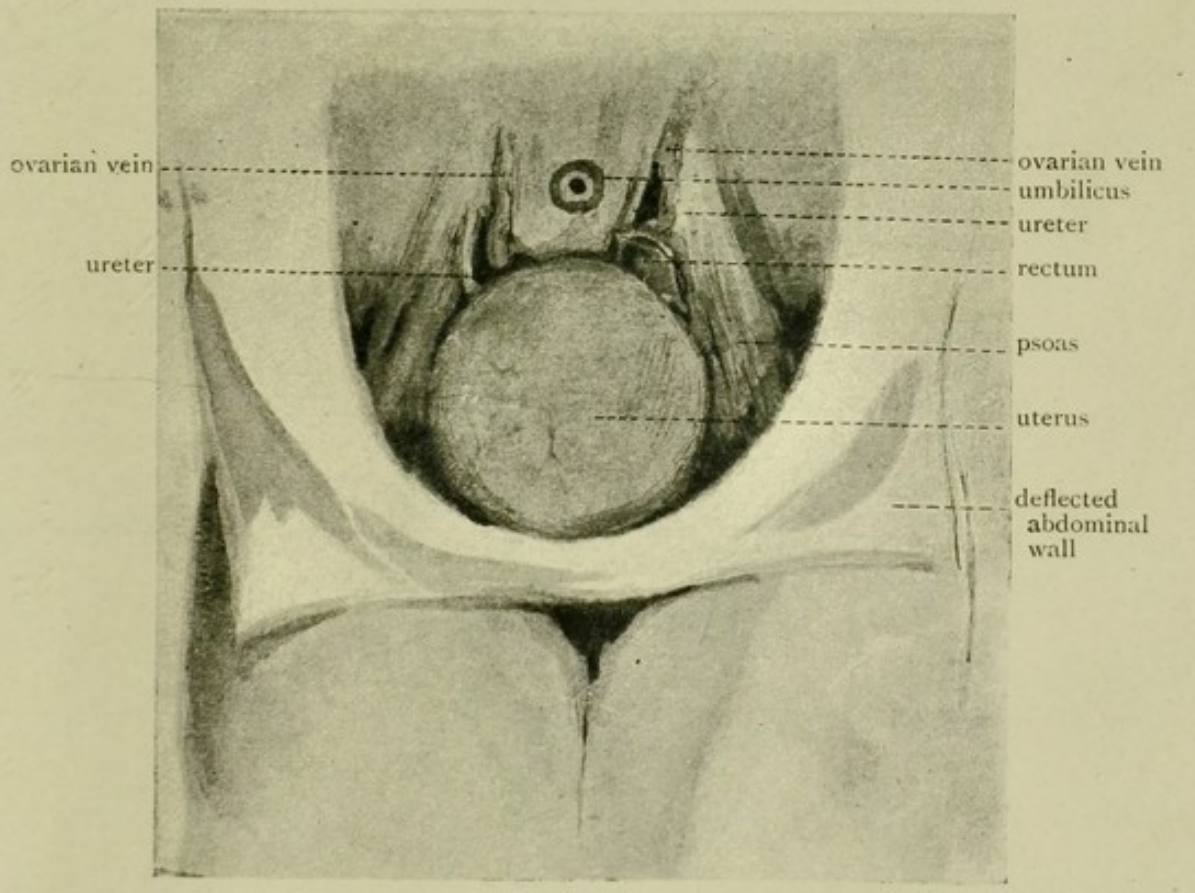

Fig. 54.—Opened abdomen of a woman three and a half months pregnant. The intestines have been removed. The case died of chorea in St. George's Hospital. (Se also fig. 55).

due to the growth in bulk of the body. The cervix is thus carried somewhat further backwards in reference to the vaginal outlet. When the end of the *third* month is reached the fundus is level with the pelvic brim (fig. 53), and may be felt on moderately deep pressure rather above the top of the symphysis. At the end of the *fourth month* the fundus is in contact with the anterior abdominal wall just above the pubes, and can be readily felt on abdominal examination.

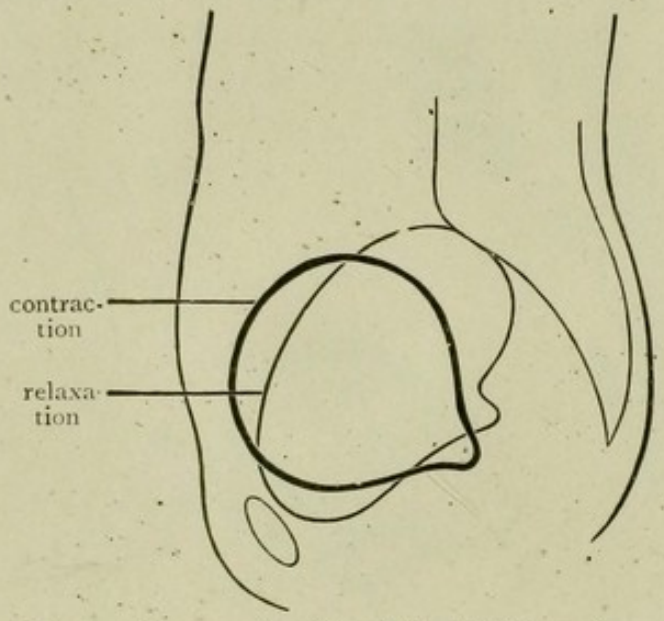

Fig. 55.—Diagram showing relations of uterus when relaxed, as in fig. 54, and when contracted.

The fundus reaches the level of the umbilicus at *five and a half months.* At the *seventh month* it is about half-way between the navel and the xiphoid cartilage, and during the *ninth* it is up to the lower ribs (fig. 48). In the *last week or two* the fundus falls

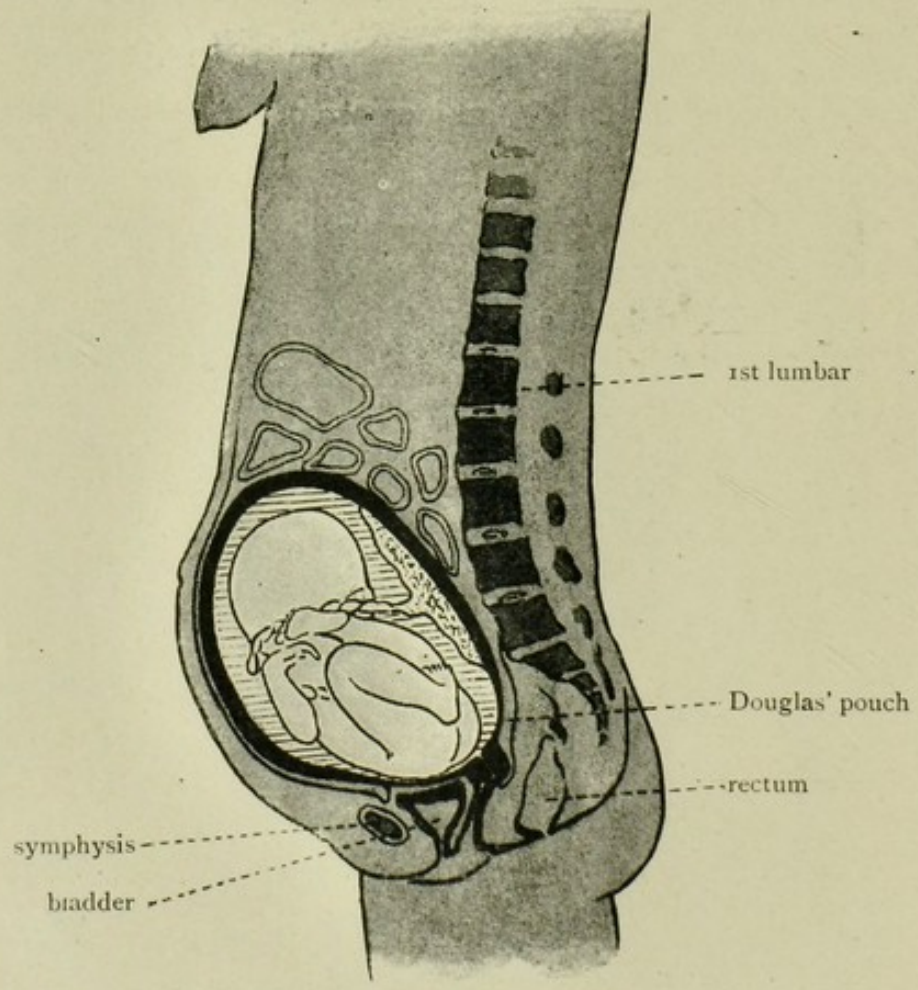

Fig. 56.—Uterus at six months.

rather forward, and the level of the whole uterus is said to be lower on account of its sinking slightly into the pelvis.

The relative positions of the uterus and the abdominal viscera at term are indicated in the diagram (fig. 48, p. 33).

The pregnant uterus retains the usual slight amount of dextro-rotation of the non-gravid state—that is to say, its anterior surface looks slightly to the right (figs. 63 and 64).

It has also commonly some obliquity, which is most marked at term, and it leans to the right as a rule, rarely to the left. In 89 cases examined at the General Lying-in Hospital, the fundus was found to be inclined to the right in 53 (59 per cent.), and in 36 (41 per cent.) it was in the middle line. None of the cases in this series leaned to the left. (See fig. 67.)

The changes in the *endometrium*, resulting in the formation of the decidua, have been already described (p. 4).

Changes in the Uterine Muscle.—The changes are practically confined to the body of the uterus; those which occur in the cervix will be noted later.

The uterine wall increases in bulk during pregnancy mainly by increase in its muscle. This enlargement has till recently been considered to be due to a combination of the hypertrophy of existing individual muscle-cells with the formation of new ones, on the strength of Kölliker's observations.[1] He said that the increase occurred in this way up to the fifth month, and that after that date the process was limited to hypertrophy of those fibres already formed. In a large number of observations on the uteri of rabbits, it was found by Helme[2] that there was no evidence in support of the theory of the formation of new fibres; there was no division of nuclei. The existing cells enlarge, become striated longitudinally, and show some transverse rings.

This hypertrophy of the cells is a very remarkable one, each cell becoming about ten times greater in length and thickness (fig. 57).

The connective tissue was found by Helme to increase in proportion to the muscle, the increase beginning near the vessels and between the muscle-layers and bundles. Here there really does occur a multiplication of elements or hyperplasia. Some of the newly-formed cells develop into connective-tissue fibres, others remain cellular.

The new fibres being formerly supposed to be developed from embryonic cells, the exhaustion of these was imagined to be a possible cause of interference with the proper development of the uterus during pregnancy, when many pregnancies had already occurred.

Fig. 57.—Diagram showing increase in size of muscle-cells.

The arrangement of these muscular fibres in the wall of the pregnant uterus was found by Hélie, who made most careful dissections,[3] to consist

[1] Kölliker, *Mikroskop. Anatomie*, 1854.

[2] Helme, 'Muscular Fibre and Connective Tissue of the Uterus in Pregnancy and the Puerperium,' *Trans. Roy. Soc. Edin.* vol. 35, pt. 2.

[3] Hélie, *Recherches sur la disposition des fibres musculaires de l'utérus développées par la grossesse.* Paris, 1864.

in the superposition of three layers. The main layer, which is the most important of the three, lies between the other two. It consists of a close network of fibres, running in various directions and forming bundles which surround the vessels, and contain spaces which on section are of fusiform shape, and enclose the sinuses. This layer extends over the whole uterine body, and ends at the internal os. Its fibres at the placental site are described by Hunter as interlacing very closely, so as to form a powerful compressing agent to the torn vessels after detachment of the placenta.

External to this layer, and lying immediately under the peritoneum, is a sheet of fibres which lie mostly longitudinally, forming a series of loops arising from just above the level of the internal os before and behind, and arching over the fundus. A few transverse fibres are also described.

The innermost set is mainly composed of a series of rings of fibres, which surround the orifices of the Fallopian tubes, the body of the uterus, and the internal os. To the latter they stand in something of the relation of a sphincter.

It has been found in the examination of uteri at various stages of pregnancy that there is to be made out, immediately above the level of the internal os, a zone of the uterine wall which varies in width, distinctly thinner than the rest of the body (see fig. 110). This part has been called the **lower uterine segment**, or *isthmus*, and is more fully developed as the uterus becomes modified in shape by the process of labour (see p. 98). It is marked out more or less distinctly by the fact that over its surface the peritoneum is less firmly attached than it is over the rest of the uterus above this level. It is the part which, during labour, is dilated to allow of the passage of the fœtus, as this is being expelled by contractions of the thicker upper segment. Its muscular fibres are arranged mostly in rings, and few of the longitudinal fibres or those belonging to the middle layer are found in it.

Changes in the Vessels.—The trunks of the uterine and ovarian *arteries* become enlarged to supply the increased needs of the organ. They increase in length as well as in calibre. The smaller branches are much enlarged, and are very tortuous; and those in the uterine wall have the corkscrew form already alluded to.

The veins become correspondingly increased in size, and the sinuses in the uterine wall are especially developed at the placental site. There is no special muscular coat to these sinuses, and their occlusion depends on the contraction of the uterine muscle. They are also destitute of valves; but their shape and relation to the muscle surrounding them cause their lumen to be at once obliterated on any alteration, caused by contraction, in the planes of the tissues around them.

The above description of the muscle and the vessels in the uterine wall applies to these structures up to about the sixth month. After this, certain changes of a more or less retrogressive kind are found to occur. They

prepare the vessels for the thrombosis which must take place immediately after labour, but the change in the muscle-fibres cannot be definitely said to be any change known to produce increased activity. The muscle-cells were found by Helme to undergo a certain degree of hyaline change; they become glassy, and occasionally vacuolated. In the connective tissue among the fibres there appear epithelioid cells, especially around the vessels, and also some larger, multinucleated cells (plasmodia).

The vessels undergo important changes. The endothelium of the vessels proliferates and the cells of the muscular coat of the arteries swell and become hyaline (fig. 41). The swelling and proliferation in the sinuses were described by Friedländer,[1] and again by John Williams.[2] The lumen of the arteries and sinuses is thus narrowed in a degree corresponding to the amount of change. (See also p. 27.) Further, there is found, especially at the seat of these changes, but also in sinuses which have remained unaltered,

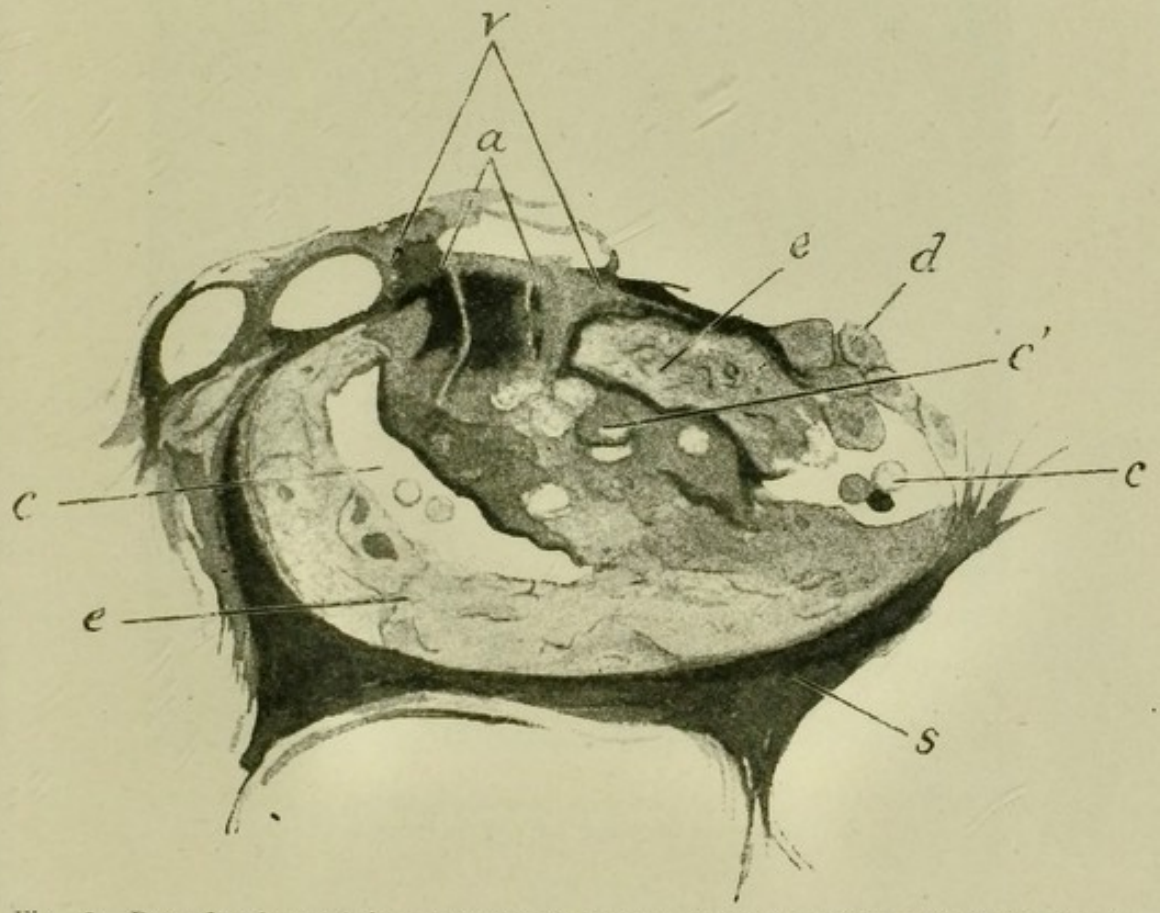

Fig. 58.—Part of a placental sinus, showing the hyaline thickening of the endothelium (semi-diagrammatic). *s*, sinus wall; *v*, villus, with *a*, a vessel, and *c'*, corpuscles (fœtal); *c*, blood-space, with corpuscles (maternal); *d*, decidual cells; *e*, proliferated endothelium of sinus. This figure of a placental sinus may stand for a uterine sinus, as the changes are similar.

a varying amount of thrombosis. The sinuses are compressed too, from the outside, by the collection of cells in the connective tissue around them. Some of the arteries also become thrombosed (fig. 59).

The changes in the sinuses and their surroundings will be again mentioned in the chapter on the Puerperium.

[1] *Arch. f. Gyn.* bd. ix. p. 22.

[2] *Obst. Trans.* vol. xx. p. 172.

Lymphatics.—There can be no doubt that these are enlarged in proportion to the other elements of the uterus. There appears to be in the unimpregnated uterus a deep and a superficial layer of channels in relation with the endometrium. The deep layer lies beneath the attached surface of the mucosa, and sends up smaller vessels which come to lie immediately under the epithelium, and surround the mouths of the glands, there being no tissue between the gland and the lymphatic walls.[1] There seems to be no well-defined subserous layer of lymphatic channels, such as had been previously described, but the muscular bundles are surrounded by such channels. Seeing how close the lymphatic vessels lie to the epithelial surface of the uterus, it is easily understood that septic absorption would not be difficult,

Fig. 59.—Thrombosis of a spiral artery, immediately beneath the placenta. The villi are seen in the upper part of the figure. (Eden).

and that this would be favoured by imperfect uterine retraction, which would allow many of the lymphatic vessels, as well as the sinuses, to remain patent.

Nerves.—The nerves take part in the general growth, and the individual fibres also become thicker, but rather, it is found, from increase of the primitive sheath than of the actual nerve-substance.

Cervix.—In addition to participating to a slight degree in the enlargement of the uterus, there are some special changes which occur in the cervix.

[1] Hoggan, *Obst. Trans.* vol. xxiii. p. 4.

2nd. Erratum.

Page 45, fig. 60. In this figure the letters M and D are transposed.

Before mentioning these, however, it will be as well to state again that the cervix under no circumstances bears a part of the decidual membrane, nor

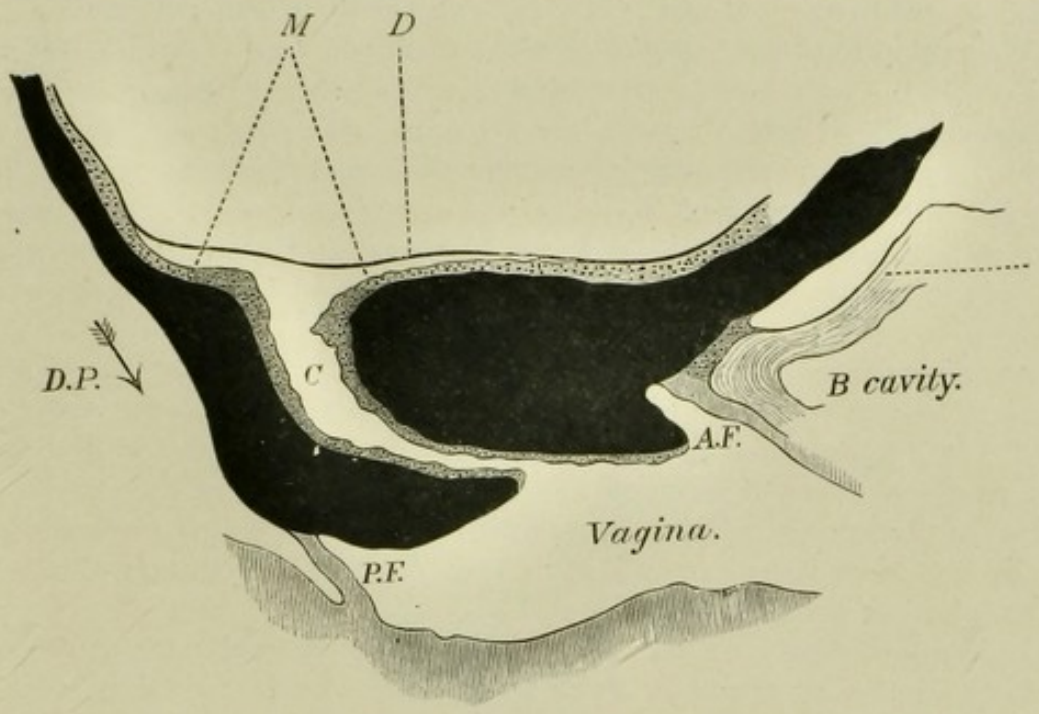

Fig. 60.—Apparent shortening of cervix in pregnancy. *D P*, Douglas pouch; *C*, canal of cervix; *A F*, anterior fornix; *P F*, posterior fornix; *B cavity*, bladder; *D*, decidua; *M*, membranes—amnion and chorion. (After Hofmeier.)

does it take any part in containing the ovum while this is developing. There has been much controversy as to whether the cervix was in any degree occupied by the ovum during pregnancy, and Bandl believed that in the later months of pregnancy the internal os was drawn up to a level above the symphysis; the upper part of the cervix being thus dilated, and becoming a portion of the ovum-containing cavity of the uterus. What he considered to be the internal os was, no doubt, the boundary already described as dividing the upper from the lower segment, or isthmus. There seems to be no doubt that any real expansion of the internal os is really the commencement of labour, though it may be found several days before obvious labour-pains make their appearance. There are two special changes of which there is no doubt. One is an apparent shortening of cervix; and the other is a softening of a characteristic nature.

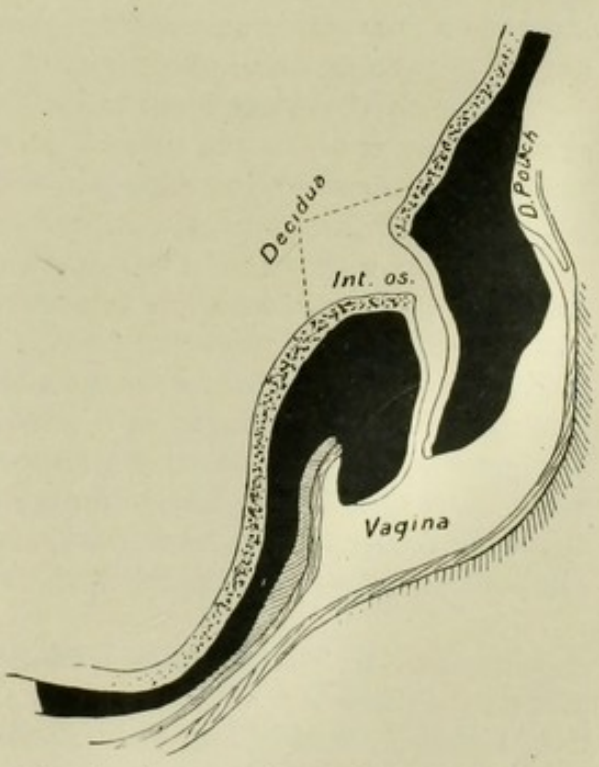

Fig. 61.—Apparent shortening from bulging of anterior uterine wall.

The deceptive impression of a shortening of the neck of the womb that

is given to the examining finger is due to the fact that the uterus presses down in the pelvis until some of its weight rests on the pelvic floor, at a spot on the posterior vaginal wall, and that the cervix is thus compressed. It is usually bent so that the external os looks forwards in the axis of the vaginal canal (fig. 60); or it may be expanded in width, while its length is apparently diminished. The other reason for apparent shortening is the downward bulge of that part of the anterior uterine wall just above the cervix (fig. 61). This must be distinguished from the real shortening, which, as we shall see, is one of the most certain signs of commencing labour, and means that the canal of the cervix is being opened up and occupied by the bulging ovum.

Softening of the Cervix.—This is an œdema, caused by the slight impediment to the return of blood produced by pressure on the veins of the uterus. It begins about the second month, or even during the first in some cases, as a thin layer of softened tissue covering the tip of the cervix. This can be readily felt in primiparæ when it is present, but it is obscured at this time by the more irregular and somewhat cicatricial condition found in the woman who has previously had a child.

As pregnancy goes on the œdema invades more and more of the cervix, gradually advancing upwards, and at term the whole vaginal portion is so soft, that there may be some difficulty to the unaccustomed finger in finding it at all on a vaginal examination. The glands also secrete much more freely now, and the large quantity of mucus in which it is bathed renders the cervix still more difficult to define. In multiparæ, however, this softening may be so much concealed by the induration alluded to, that it is not a sufficiently marked sign to be of much value. Softening, as might be expected considering its nature, is sometimes found in the case of fibroid tumours, which are large enough, or so placed, as to hinder venous return.

Owing to the same obstruction to the venous return, the cervix becomes slightly blue at about the same time that the œdema appears. This *blue* or *violet discolouration*, beginning in the cervix, will be seen to spread down to the vaginal orifice as pregnancy advances.

There is a difference in the shape and openness of the cervix in primiparæ and multiparæ respectively, as well as in the texture; for in the latter, as will be described in the chapters on Labour, the cervix will often admit the finger, sometimes as far as the internal os, and in the last weeks occasionally through it; while in the former the cervix remains quite as closed as before impregnation. In passing the finger into the cervix of a multipara, one or more of the mucous glands of that organ are sometimes found to be considerably enlarged and distended, forming prominences the size of a bean (Nabothian glands); and the canal is usually filled with mucus.

Changes in the Vagina and Vulva.—In quite the early months of pregnancy there is a difference in the feel of the vagina on digital examination, and this is most marked in primiparæ. It consists in a sensation of laxity and inelasticity, and the increased secretion of mucus by the cervix makes the canal seem still more pliable. As pregnancy advances, the vaginal walls are felt to be distinctly increased in bulk, and to some extent to be thrown into folds. The increase in bulk is to a large degree caused

by the venous congestion ; and on account of this congestion, which extends from the cervix, the colour of the mucous membrane becomes bluish, the change advancing from above downwards. At the vulva this change in colour becomes manifest during the fourth or fifth month, but it may be seen earlier in some cases. There are sometimes varicose veins in the walls of

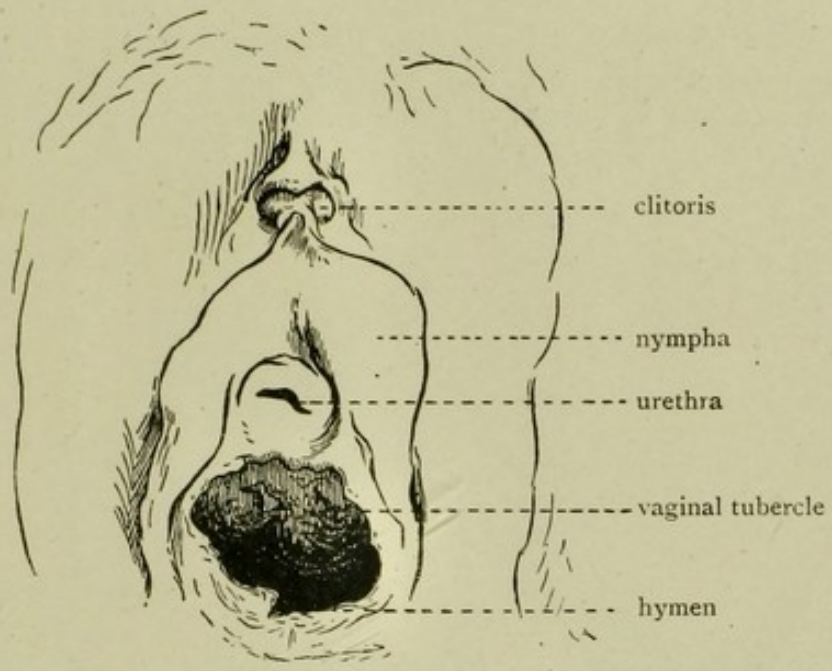

Fig. 62.—Varicose veins below urethra.

the vagina and vulva. These are often marked in the portion of the vagina immediately behind the urethral orifice, the 'vaginal tubercle' (fig. 62), and may cause great inconvenience, especially in women who have borne children before, and in whom the parts are lax. The veins of the labia majora, also, are found to be varicose in many cases, again more commonly in multiparæ.

Changes in other parts adjacent to the Uterus. *Broad Ligaments and Peritoneum.*– In the growth of the uterus during pregnancy, the upper edges of the broad ligaments are carried higher by the rising of the fundus. This goes on until the edge, instead of being about horizontal, as in the unimpregnated woman, becomes vertical. The uterine end of this edge is not, however, in the same relation to the fundus uteri as before pregnancy ; but, owing to the great enlargement of the fundus during the later months, this part of the uterus is elevated above the level of the cornua, from which the tubes which correspond to the upper edge of these ligaments spring. The relations of uterus and broad ligaments are shown in the diagram (fig. 63), in which the tubes are seen to arise from about the junction of the upper and middle thirds of the uterus.

The attachment of the ligaments to the pelvic walls at the side is raised to some degree.

As regards the anterior and posterior peritoneal pouches there is a difference of opinion, but it seems, from the evidence of frozen sections, that the peritoneum is to some extent stripped off the bladder, and that this is due in great measure to the sinking of the bladder as the pelvic floor descends, and not so much if at all, to the drawing up of the peritoneum

by the rising uterus. The central part of the bottom of Douglas' pouch is not observed to be raised during pregnancy at all.[1]

The differing degrees of firmness of attachment of the peritoneum to the body has been mentioned, and the cervix posteriorly, like the lower segment, has its peritoneal covering loosely attached.

The round ligaments and the muscle-fibres in the broad ligaments share in the hypertrophy of the uterus. The former increase to about the thickness of the little finger, and can in very many subjects be felt through the abdominal walls in advanced pregnancy, the left one being the more readily accessible owing to the dextro-rotation of the uterus, which brings the left

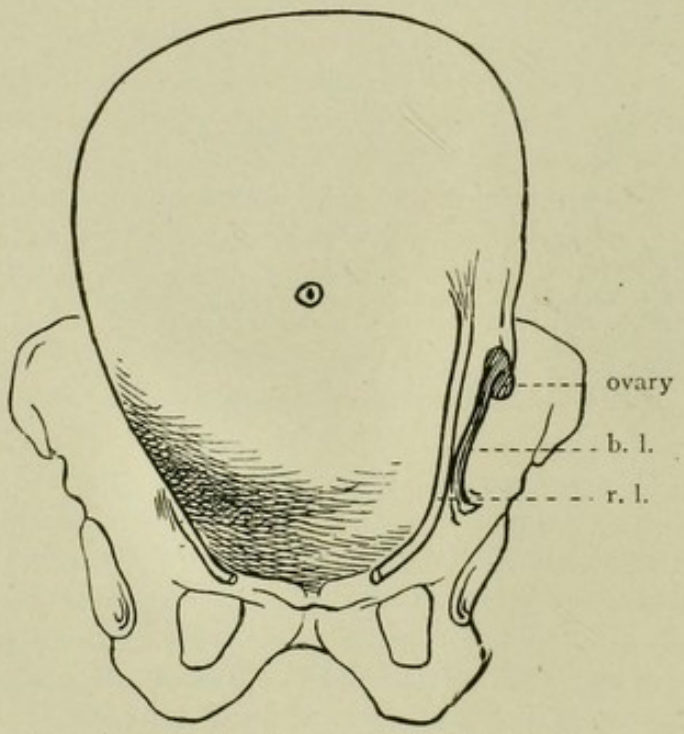

Fig. 63.—Relation of ovary and broad ligament at term.

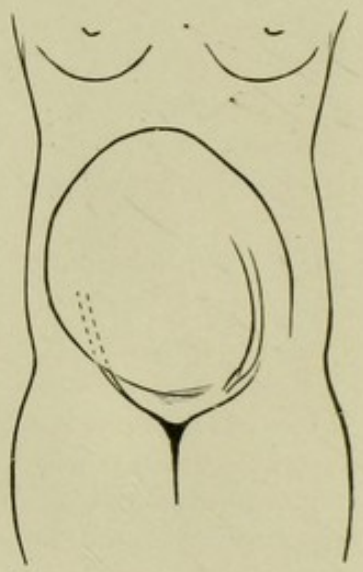

Fig. 64.—Right obliquity and dextro-rotation of uterus, showing left round ligament.

side forwards. They also increase in length. The ovaries are raised to slightly above the level of the pelvic brim. They are brought close to the side of the uterine body, owing to the growth of the uterus between the layers of the broad ligament.

The connective tissue throughout the pelvis becomes much more succulent and distensible, and this serous infiltration affects adhesions resulting from previous peritoneal inflammation, rendering them more easily stretched by the growing organ.

Changes in the Articulations of the Pelvis.—The mobility of the separate bones on one another becomes much increased during pregnancy. There is an increased development of the existing synovial pouches in the sacro-iliac and the pubic joints; and this condition may go on in extreme cases to a degree which makes it almost impossible for the woman to walk with comfort.

The effect at the symphysis pubis is that the ends of the apposed bones

[1] Barbour; Webster; Polk, *N. Y. Med. J.* vol. xxxv. p. 560.

can glide on one another much more freely; and there is also some, but not much, power of separation. In the sacro-iliac joints this relaxation allows of an extended swing of the sacrum in an antero-posterior plane; and also some capability of bending back of the innominate bones on the sacrum—such a movement as is caused when the symphysis is divided in the operation of symphysiotomy and the ends of the pubic bones are pulled apart.

The state of things at term is now seen to be one which gives great advantage in the process of expulsion of the ovum. Those parts which, as will be seen later, assist in expulsion have become hypertrophied—namely, the main portion (upper segment) of the uterine body, the broad ligament muscle and the round ligaments; and those parts which have to be stretched to allow the ovum to pass are relaxed—the cervix is softened, the lower

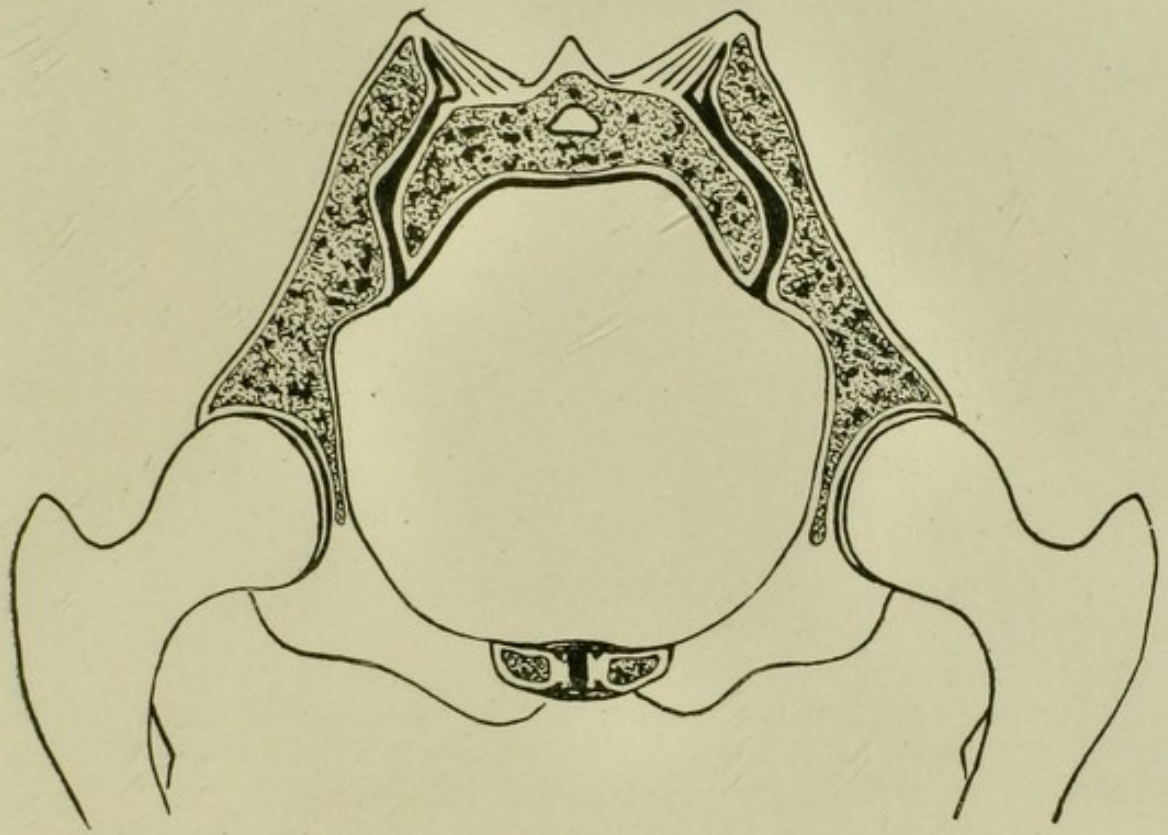

Fig. 65.—Section through pelvis (vertical), showing the sacro-iliac ligaments and the synovial cavities.

segment is thin, and the vagina and vulva are now more easy of dilatation. The relation of surrounding tissues is found to be most advantageous—the body of the uterus is surrounded by a strong, elastic, firmly attached peritoneal covering, except over its lower segment, where the attachment is loose and allows of rapid expansion; and, further, the peritoneum does not form a complete sheath round the lower segment or the cervix, but only covers the back of these, the sides being supported by the loose connective tissue in the base of the broad ligaments, and the front by that between the uterus and the bladder. The lower part of the cervix is surrounded by the easily stretched vagina.

Changes in adjacent structures caused by Pressure of the growing Uterus. *Pressure on the Bladder.*—In the early months the anteversion of the heavy fundus causes this to press on the bladder and so to produce some

increased frequency of micturition. In the unimpregnated condition the uterus accommodates itself in position to the varying modifications in size of the bladder; but during pregnancy the bladder has to adapt itself to the space available for it, and this inverted relation becomes more marked as pregnancy advances. It is during the first three months, during which time the uterus is not too large to be contained the pelvis, that the bladder is most pressed upon; for after this time the increasing size of the uterus makes it necessary that it should rise more and more above the brim, and there comes in consequence to be more room in the pelvis for the bladder. In the last months, and especially in primiparæ, the lower end of the uterus occupies most of the space in the brim and cavity of the pelvis, and the bladder has to again accommodate itself to circumstances; and it does this to an extent which in some measure depends on the laxity of its connective-tissue attachments. Thus the bladder, if much distended in the last months, is, as a rule, found to rise above the pubes, and to lie between the anterior abdominal wall and the uterus, being rather flattened. It has been found in some cases on passing a catheter that there was a pouch of bladder filling the angular space formed by the pubes, the uterine wall, and the anterior wall of the vagina—the space usually occupied by the empty bladder in the non-pregnant condition—as well as the pouch rising above the pubes. In yet other cases [1] the bladder has been found altogether in the pelvis, lying below the lower end of the uterus and forming a cradle, in which this part of the uterus lay. Here the base of the bladder must have been very firmly united by connective tissue to the vagina and the supra-vaginal cervix.

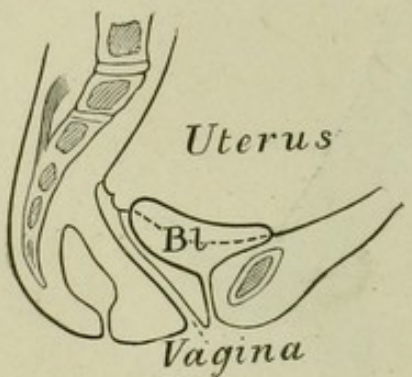

Fig. 66.—Bladder during pregnancy (one form). (After Auvard.)

The ureters have never been shown to be affected by the pressure of the gravid uterus, though it has frequently been asserted that they are. This assertion has been made to account for certain affections of the renal functions which occasionally occur in pregnancy (p. 504).

Rectum and Intestines.—The action of the rectum is interfered with to some degree during pregnancy owing to pressure, and constipation is one of the most constant troubles. The rest of the intestines seem rather sluggish, but the rectum is no doubt the part most affected.

The pressure on the *pelvic veins* and some of its results have been mentioned; piles very often appear for the first time during pregnancy, and any previously existing ones are rendered much more troublesome. The veins of the thighs and legs are enlarged as a rule, and may become slightly varicose. The varicosity is sometimes, however, very considerable, even in primiparæ; while in multiparæ, especially in those who have had this condition in earlier pregnancies, the cases may be among the most severe examples of this disease (see p. 283).

The *abdominal walls*, though they no doubt to some extent undergo a hypertrophy in connection with pregnancy, do not seem to develop much as regards their muscle. They rather passively stretch than actively grow.

[1] Auvard, *Travaux d'Obstét.* vol. I. p. 470.

They often become thicker from a deposit of fat, and fat is developed over the hips and the pelvis generally. Pregnancy, in fact, often marks the beginning of obesity.

The skin of the abdomen undergoes marked and characteristic changes. It is found at the end of pregnancy or earlier, according to the amount of stretching which is required compared with its elasticity, to be marked with a series of fusiform, ribbon-like markings, which vary in shade and colour according to the way the light falls on them, and according to the amount of pigment in the surrounding skin (figs. 67 and 68).

Fig. 67.—A primigravida at term, showing the striæ. Note also the right obliquity of the uterus.

These skin-cracks are named *Striæ*, *Lineæ albicantes*, *Lineæ maternæ*, *Lineæ gravidarum*. They are due to yielding of the corium in stretching, and their length therefore lies at right angles to the direction of the stretching. The epidermis is continuous over them without any change in structure (fig. 70). They are distributed over the lower abdomen almost exclusively, very few being found above the navel. They are mostly oblique in direction, running downwards and inwards, and making an irregular curve on each side with its concavity towards the middle line. There are some horizontal ones in most cases, and some vertical, but the general direction is, as would be expected from the lines of tension caused by the growing uterus, a more or less circular one round a point rather below the navel. The lineæ vary in length up to one or sometimes two inches, and in width from a mere line to half an inch or more. The shape is sometimes irregular from several striæ running together.

The colour of the lineæ when newly formed is a warm grey, approaching pink in places and bluish purple in others. Some months after the pregnancy is over they begin to get whiter and more opaque, and in subsequent pregnancies, if new ones are formed, the new and the old may be seen lying side by side, and the difference between them easily recognised.

Striæ occur under other conditions of skin-stretching than those of pregnancy. In the case of women they are often produced at the time of puberty by the rapid increase in bulk about the pelvis, and they may occasionally be seen on the thighs of men who have grown very rapidly

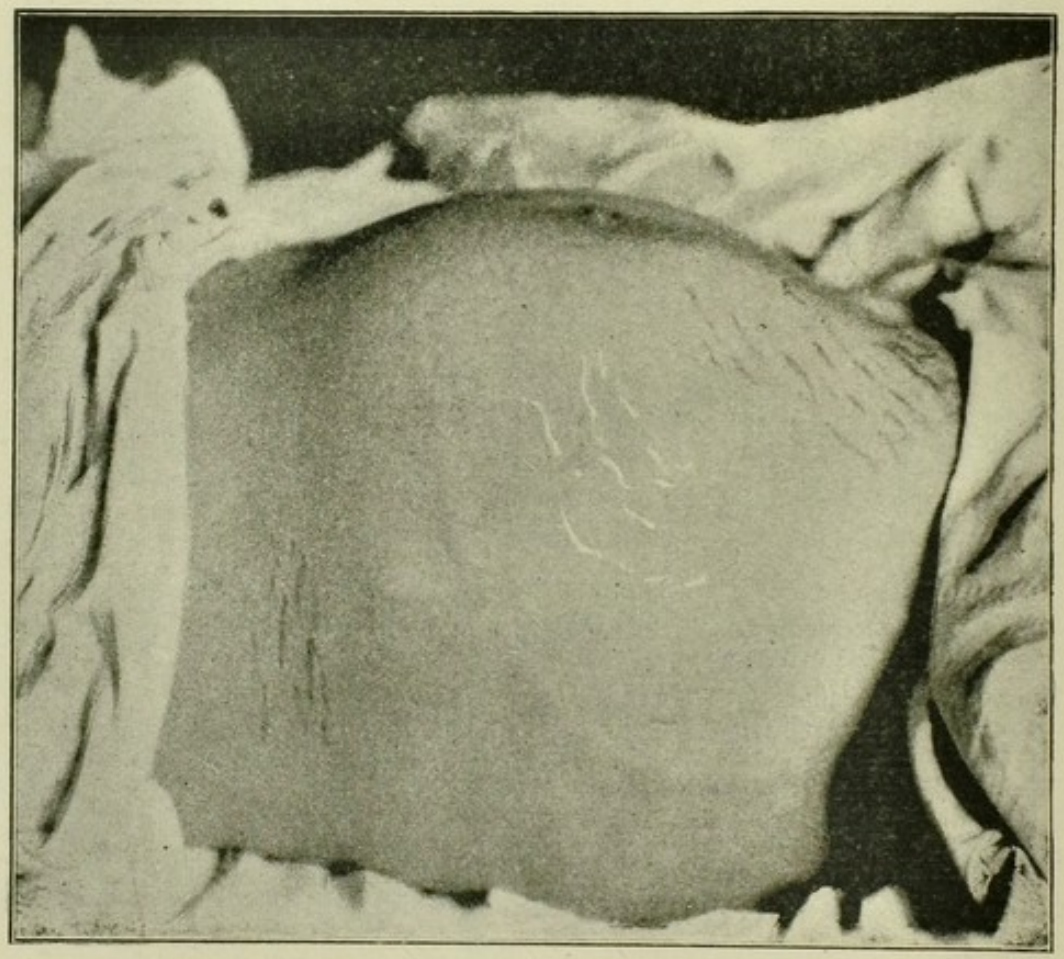

Fig. 68.—From the same case as fig. 67. Striæ are seen over the lower ribs, a somewhat unusual position.

within a short period. They are found on the breasts of women apart from pregnancy where there has been a rapid increase in the size of these organs by fatty deposit, such as often takes place at puberty.

Changes in the Breasts.—These consist in a gradual preparation for the function of lactation which will have to be performed after the birth of the fœtus, and of some small incidental alterations in the framework and coverings of the glands.

The glands attain complete development at the first pregnancy. The lobules then enlarge and become more distinct from one another; the epithelium lining the acini becomes active, and desquamation into the cavity of the acini occurs. The epithelial cells thus set free are in a state of fatty degeneration, and constitute the *Colostrum corpuscles*. Serum is secreted early in pregnancy, and may be squeezed from the nipple in the second or

third month. Later on the colostrum cells are found in the secretion, and their presence causes the fluid to have a streaky yellow appearance. The secretion exudes imperceptibly from the breast as soon as it begins to be secreted, and in most cases forms a thin incrustation on the nipple which can be seen at any time during the last six months of pregnancy.

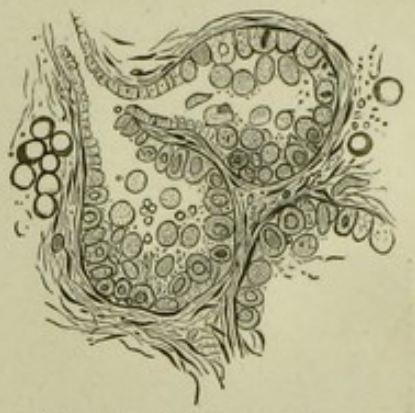

Fig. 69.—Colostrum stage.

The acini, on being examined microscopically, are found to be lined with a layer of cubical or cylindrical epithelium, and to have their cavities filled with granular cells during all the time the secretion remains in the colostrum stage—in fact until the third day after labour, when the character of the secretion changes to that of milk, as will be described.

While the development of the breast tissue is going on, the fat in the connective tissue which forms the framework of the gland increases in quantity, and the whole organ becomes enlarged and full. The skin over the breasts is stretched, and often develops skin-cracks which have a radial distribution and direction. Numerous blue veins may be seen beneath the skin. The most characteristic changes occur in the areolæ and nipples. The former become in all cases but those of the very blonde type pigmented in a varying degree. In dark women the colour becomes of a very dark

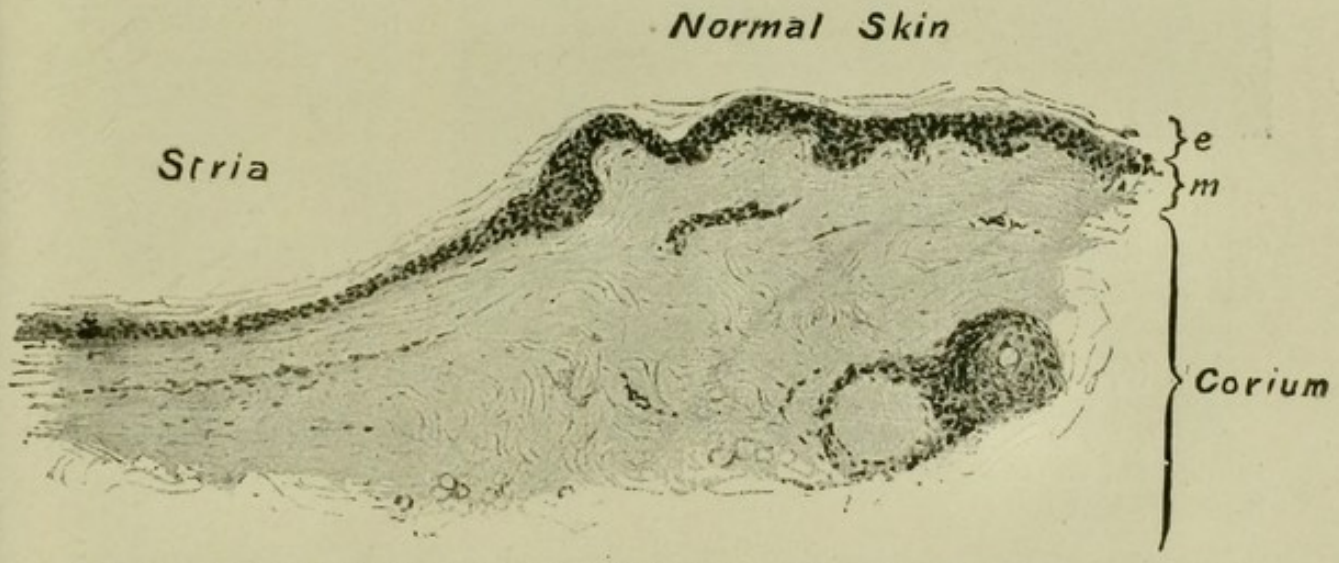

Fig. 70.—Section through edge of old stria from abdomen. The unaltered skin is seen on the right, the stria on the left. Note the absence of papillæ, the thinness of the Malpighian layer and the condensation of the fibrous tissue of the corium.

brown, in negresses jet-black. On the surface of the areola the sebaceous follicles, from ten to twenty in number, are found enlarged. The colour of these is rather lighter than the rest of the surface, and they are easily seen. At the edge of the areola the pigmentation assumes a somewhat irregular outline, owing to its extension over the adjoining surface beyond the original edge. As the area of pigmentation extends it surrounds the sebaceous glands immediately adjoining the areola, and leaves them uncoloured. This gives rise to an appearance more or less peculiar to pregnancy—namely, that

of a number of paler spots on an extension of the pigmented surface—the *secondary areola* of Montgomery, who, in describing it, compared it to a stained surface from which the colour had been discharged when drops of water had fallen on it. The secondary areola is to be seen first about the fourth month in most cases, and begins at the upper and outer edge of the original areola (figs. 71 and 71 A).

The nipples become moister in texture, and readily undergo erection on stimulation. The dried secretion mentioned is visible on their summits, and serum can usually be squeezed through them any time after the beginning of the third month.

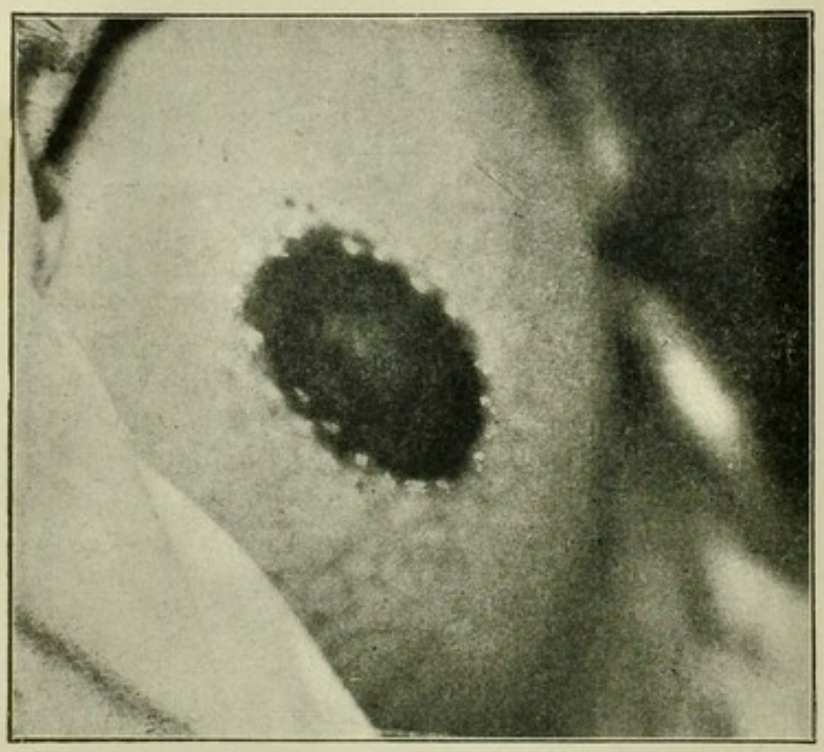

Fig. 71.—Areola and secondary areola in a brunette at term.

Previous pregnancies may modify the history of this development. If the woman becomes pregnant while she is suckling a child, there is, of course, milk in the breasts at the beginning. This, however, as a rule, soon disappears, the energy of the system being directed to the uterus. The pigmentation of former pregnancies, though these may be remote, does not entirely disappear, and the edge of the areola nearly always remains somewhat irregular.

(*b*) Changes in other than the Generative Organs

The local changes just described are accompanied by alterations of function or of structure in the other systems of the body ; and these will now be described.

Nervous System.—In the case of the nervous system the changes are, as far as is known at present, entirely functional.

The pregnant woman, especially if she is pregnant for the first time, is usually the subject of a certain instability in the discharge of her nervous functions, as evidenced by the prevalence of mental affections during this period, and also of chorea, and other disorders showing loss of regulating power.

Short of such serious disturbances as these, the instability shows itself not uncommonly in a change in the woman's disposition, which may be for the better, but is oftener for the worse. She may become irritable or morose, or may be the victim of unfounded prejudices of different kinds ; the

'longings' of pregnancy are an instance, for here the woman has or imagines she has desires for various articles of food, or for substances which are not usually employed as food, such as pickles or other sour things, or starch or raw rice. These longings are explained by Giles [1] as being the desire for something to check the feeling of nausea in pregnancy, and in this case sour things would naturally be thought of; or the expression of an instinctive want for some class of food in the altered condition of pregnancy; or, in many cases, a kind of auto-suggestion prompted by a popular tradition. They are most often met with in primiparæ.

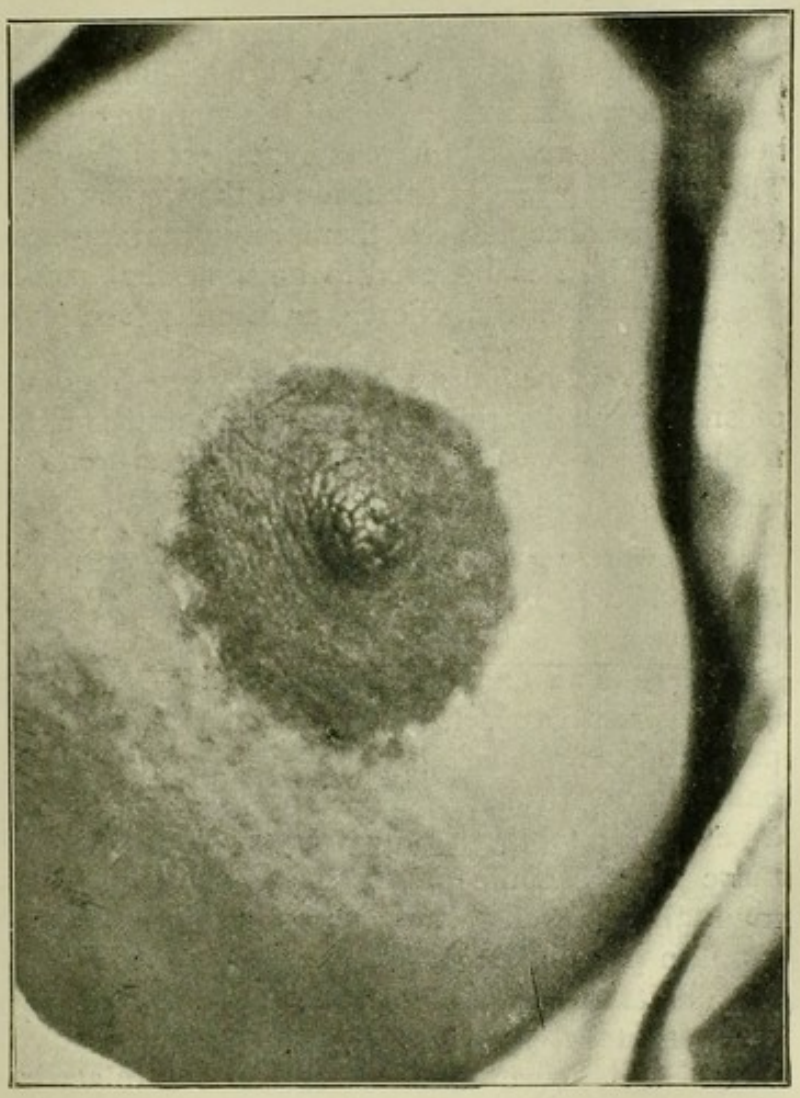

Fig. 71 A.—Areola and secondary areola in a blonde.

Vomiting of pregnancy.—This affection, from which about two-thirds of all pregnant women suffer at some time or another of their pregnancy, seems to come under the heading of affections of the nervous system. There is no physical change in the stomach to account for it in the early months, and in the later ones it may or may not be due to the mechanical compression of the stomach by the fundus uteri. It is probably not.

Sickness begins in a very large majority of cases early during the second month of pregnancy; [2] it commonly persists during the second and third months and ends in the fourth. In some cases it lasts throughout pregnancy. It may begin in the later months, the seventh, eighth, and ninth.

Giles finds that vomiting is commoner in women who suffer much pain and lose much blood at menstruation.

The disturbance may be either mild or severe when it is present. It is sufficiently frequent in occurrence to be looked upon as one of the suggestive

[1] *Obst. Trans.* vol. xxxv. p. 242.

[2] According to Giles (*Obst. Trans.* vol. xxxv. p. 303, 'Observations on the Ætiology of the Sickness of Pregnancy') vomiting most frequently begins in the first month. These facts are founded on the observation of 300 cases in the General Lying-in Hospital. The subject is one which it is obviously rather difficult to accurately investigate.

symptoms of pregnancy when it is concurrent with amenorrhœa, but it is of course not diagnostic (see p. 59). Vomiting from definite physical changes in the stomach or from cerebral tumour for instance, occurring during pregnancy, must be distinguished from the vomiting of pregnancy affecting a healthy woman.

The woman is usually attacked by nausea and vomiting, or only nausea, when she first rises in the morning. This may only happen occasionally, or may take place every morning, and it may or may not recur during the day. The transition in degree from what may be considered almost physiological to a severity which is undoubtedly pathological is imperceptible.

As regards the *causation* of the vomiting little is known beyond what has been said above. Numerous hypotheses have in consequence been invented. The unstable nervous condition of the woman during pregnancy is, according to the most acceptable of them, an important element in the matter, and the state of things is believed to be somewhat similar to that supposed to be present in eclampsia, chorea, or insanity (see pp. 509, 280, 556).

The nerve-endings are affected very frequently. Alterations of vision, of smell, and hearing ; of sensation, and sometimes of motion ; and very frequently of vaso-motor nerve-endings, resulting in pruritus, neuralgia, anæsthesia, and other perversions of function, are not rare.

Circulatory System.—There is a distinct increase in the *quantity of the blood*, which is no doubt caused by the addition of the large uterine circulation.

There is also a change in the *quality*. More fibrin and white corpuscles and less red corpuscles and albumin are found to be present. There is thus produced a physiological chlorosis, which is accompanied, as in the pathological variety, by a *dilatation of the heart*. Dilatation must necessarily take place ; for as the quantity of the blood-mass is increased, either the pulse must become more rapid or the cavity of the heart must enlarge to maintain the same rate of circulation as before. The pulse is not more rapid in pregnancy, and the heart's apex is found to be displaced a trifle outside its ordinary position. The dilatation is combined with a perfectly compensatory *hypertrophy*, and instead of the blood-pressure being diminished, as would be the case if only dilatation of the heart were present, it is on the contrary found to be increased.

These changes in circulation and in the quality of the blood vary in degree according to the original soundness of the woman, and according to the state of nutrition maintained during the pregnancy.

In some cases there is marked increase in the size of the *thyroid gland*, especially in women who have already a tendency to goître ; and where there is any *exophthalmos* before pregnancy the protrusion becomes more marked. The *spleen* is found to be somewhat enlarged (by about an ounce or so).

The blood-changes may go on to a dangerous state of anæmia, and the gradations are infinite ; on the other hand, pregnancy often benefits a diseased heart for the time by causing its walls to hypertrophy.

Respiratory System.—As the uterus ascends in the abdominal cavity, it

diminishes the range of movement of the diaphragm according to the amount of encroachment on the available space. The *thorax*, however, to compensate for this, *widens* to a slight extent at its base, though it diminishes slightly in its antero-posterior measurement at this level, owing probably, as Dohrn suggests, to the upward pressure of the uterus on the diaphragm dragging on the attachments of the muscle, which yield at the weakest point, the anterior part of the thorax.[1] The vital capacity of the chest is little if at all diminished. Owing, no doubt, to the increased oxidation-processes going on, the amount of expired carbonic acid is somewhat increased.

Alimentary System, including Nutrition.—In healthy women there is probably little change in the assimilation and chemical changes of the food during pregnancy. There is, however, as a rule, increase of fat in the system, and the body-weight is greater, apart from the weight of the uterus and ovum. Certain diseases seem to have a close connection with pregnancy ; osteomalacia is one of these, also acute atrophy of the liver, and Garrod finds that gout is rather more common in women who are pregnant than in others (see also Diabetes, p. 298).

The digestive troubles consist in the characteristic vomiting of pregnancy (see p. 55) ; in constipation, and in salivation, which is occasionally present.

The gums are found to be thickened and reddened at their edges in a large number of cases, most frequently in the class of hospital patients.

Urinary System.—It is said by Tarnier and Chantreuil that the total solids in the urine are diminished, with the exception of the chlorides, though this is denied by Winckel.[2]

Albumin.—Hypolitte and other observers have found traces of albumin in about one-eighth of all cases, but traces only. This may have to do with the changes described later as occurring in parenchymatous organs during pregnancy. Sugar is occasionally found during the last few days.

Osseous System.—In addition to the modifications in the nutrition of bone mentioned as osteomalacia, irregular deposits of calcareous matter, called Puerperal Osteophytes, are found on the inner surface of the skull. These are not peculiar to pregnancy, but have been found in other conditions. They were first described by Rokitansky.

Cutaneous System.—(For a description of Lineæ albicantes, see p. 51).—The skin in pregnancy increases in activity. There is a deepening in colour of parts ordinarily more or less pigmented. Thus the areolæ become darker, as already described, and there is an increased deposit of pigment over the linea alba on the abdomen ; and this in dark women forms a well-marked line reaching from the pubes to the umbilicus. The skin round the eyes is also darkened in varying degrees, and sometimes irregular deposits of pigment appear on the face, and resemble those patches which are often found in connection with osteo-arthritis.

[1] Dohrn, 'Die Form der Thorax-basis,' &c., *Monats. f. Geb.* vol. xxiv. p. 414, vol. xxviii. p. 457 ; and Herman, *Obst. Trans.* vol. xxxii. p. 108.

[2] As regards urea excretion, see Herman, *Obst. Trans.* vol. xxix. p. 530 and sqq.

There is greater activity of the sebaceous glands, especially in those near the genitals and the breasts.

In a certain number of cases, lumps appear in the skin of the axilla, mostly at the end of pregnancy. They were first described by Champneys, who observed them in 27 women out of 377 who were confined in the General Lying-in Hospital.

There was no opportunity until lately of examining them microscopically, and from the secretion which could be squeezed from them they were looked upon as a specialised form of sebaceous gland. They are now found [1] to be composed of modified sweat-glands, and the neighbouring sebaceous glands are not altered.

The lumps are situated in the skin of the axilla, and this cannot be pinched up over them ; but they can be raised from the deeper structures, and do not resemble lymphatic glands in any of their connections. They vary in size from 'the smallest perceptible to that of an egg, or perhaps larger.' They are in their most characteristic state during the lying-in period, when their course of development coincides with that of the breasts. They are present sometimes at the beginning of pregnancy, especially if they have existed in a previous pregnancy.

No secretion flows spontaneously from them, and they thus differ from axillary mammæ ; but when they are squeezed at or soon after the time of labour, granular débris, like the secretion of sebaceous follicles, then colostrum, and then milk, successively appear. The secretion, however, varies in uniformity over the surface of the lump at any one time ; and the secretion is produced over the whole surface. They are often painful, and are found in a few cases to be so during subsequent menstruations.

CHAPTER VI

DIAGNOSIS OF PREGNANCY

THE subject of the diagnosis of pregnancy will be considered in this and the ensuing chapters under the following headings : Diagnosis of the Existence of Pregnancy ; Diagnosis of the Date of Pregnancy ; Diagnosis as to Parity or Nulliparity ; Differential Diagnosis.

DIAGNOSIS OF THE EXISTENCE OF PREGNANCY

The method adopted will be to enumerate the symptoms and signs in turn, and consider the fallacies in each case.

Symptoms. 1. *Suppression of Menstruation.*—The failure to appear of an expected menstruation is the first event which suggests to a woman that she is pregnant.

[1] 'On the Development of Mammary Functions by the Skin of Lying-in Women,' *Med. and Chi. Trans.* vol. lxix.; and Champneys and Bowlby, *Med. and Chi. Trans.* vol. lxxviii.

Such cessation may occur in several modes. Usually it is quite sudden ; that is to say, the woman has menstruated regularly and according to her own type up to a certain month, and then the expected flow fails to arrive. There is complete absence of any sign or symptom of the monthly process. The amenorrhœa lasts during the pregnancy.

In another class there is one, more rarely there are two, and still more rarely three attempts, more or less complete, at menstruation after conception has occurred. The question of menstruation during pregnancy will be more fully discussed under the heading of Hæmorrhages (p. 335). Suppression due to pregnancy may take place in a woman who is always irregular in her menstrual rhythm, and then the condition may easily be overlooked, the omission of menstruation being regarded at first as a longer than usual interval.

Pregnancy may occur during the amenorrhœa of lactation, and then there will have been no menstruation since the time before the last pregnancy ; or during the amenorrhœa of chlorosis or other debilitating disease ; or before the first menstruation has appeared at puberty ; or possibly after the menopause is supposed to have arrived. In these cases some confusion might arise if the possibility of impregnation taking place under such conditions were forgotten.

It must be remembered, too, that the occasion may be one on which the statements of the patient should not be too implicitly believed, for she may be anxious to conceal the fact of her pregnancy ; and in the case of her statements not agreeing with physical signs, there can be no hesitation in relying on the latter evidence in preference to the former.

2. *Vomiting.*—The date of commencement of this and its characters have been described. It is a sign of moderate value. It may be entirely absent throughout.

Care should be taken that it is not due to any of the following states : (*a*) Chlorosis with gastric ulcer, in which combination, a not very uncommon one, there will be found to be sickness, and most likely amenorrhœa.

(*b*) Hysteria, combined with chlorosis and flatulence. The woman may vomit, have a distended abdomen, and there may be amenorrhœa.

(*c*) Ascites from hepatic disease. Here there may be vomiting, together with the abdominal enlargement.

There are other conditions which may lead to a combination of symptoms more or less resembling those of pregnancy, but the above-mentioned will be enough to illustrate some of the possible ones.

3. *Quickening.*—The existence of this symptom must be accepted on the woman's own statement. It consists in a sensation of something stirring inside her, and it was believed, when the term was invented, that at this time the child first became a living creature. Quickening usually appears about the middle of pregnancy, and no more exact statement can be made about the date than this. It is of very little value, therefore, in calculating the probable date of delivery. The variations in the date of its first appearance are due to the difference in quantity of liquor amnii in different cases, and also in the sensitiveness of different women. Primiparæ are said to feel it on an average about a week later than women who have previously

borne children, and this may be due to the fact that it is not so soon recognised and carefully noted as it is by women who have felt it before.

Sensations like those of quickening are sometimes caused by the movements of flatus in the intestines, and are sometimes imaginary. They are especially frequent about the time of the menopause, and not seldom occur in women who have been childless, and are hoping even now to become mothers. Any statements on this subject must be received with much caution, and only be considered as suggesting the possibility of pregnancy. (See Pseudocyesis, p. 71.)

The physical signs of pregnancy are much more important, as from some of them it can be said positively that the woman is pregnant, and also that the child is alive or is dead.

1. *Inspection.*—The standing attitude of the woman is altered according as the growing uterus throws the centre of gravity of the body further in front of the spinal column, for this necessitates the throwing back of the upper part of the chest and shoulders to bring the weight backwards again. The amount of deviation depends to a great extent on the height and figure of the woman ; a tall woman does not show the change of attitude so markedly as a short one, and sometimes women go to term without any suspicion being excited by their appearance. Other tumours, such as ovarians, have exactly the same effect when they are the same size as the enlarged uterus.

The shape of the abdomen differs at different periods of pregnancy. There is no projection of the abdominal wall forward until after the uterus has come into contact with it at about the end of the fourth month ; and any enlargement spoken of by a woman as existing before this must be due to flatulence. The abdomen of pregnancy is in the earlier months rather pointed, for there is not a uniform distension as in ascites, but a local projection. The abdomen becomes increased in width too, and this change can be well observed from behind in an increase of girth, and thickening of the figure above the hips. Pigmentation and striæ will be found according to circumstances already defined (pp. 51 and 57). The navel is very frequently, though not always, pushed out in the later months until its pit is obliterated or until there is a protrusion in its situation. This takes place in other abdominal tumours if they are large enough.

2. *Palpation.*—The position of the uterine tumour in the abdomen can be made out without the least difficulty if the uterus is contracting at the time of examination, and if the abdominal walls allow of satisfactory examination. If, however, there is relaxation of the uterus, the outlines may be very indefinite, and this character of the uterus of being hard at one time and soft at another is one of the most valuable signs we have that an abdominal tumour is the pregnant uterus (see p. 38). The alternations are most readily felt after the uterus has risen above the brim, but they may be recognised much earlier by bimanual examination.

Observations that the height of the fundus corresponds with the date of pregnancy calculated from the duration of amenorrhœa, and that, if time enough be allowed, the womb can be made out to enlarge in agreement with the rate normal to pregnancy, are most valuable as evidence.

There may in some cases be felt a thrill over certain parts of the uterus,

usually on the left side, where the uterine bruit, to be immediately described, is most commonly heard. The thrill is, in fact, a 'palpable uterine bruit,' and is synchronous with the woman's pulse.

Palpation of the Fœtus.—When the uterus is relaxed the outlines of the child can usually be felt, unless there is excess of liquor amnii, and the lie, position, and attitude can be made out after a little practice. When contraction occurs, the outlines of the child all disappear, and the surface of the uterus becomes part of a tense smooth ovoid. Fibroid tumours in the uterine wall must not be mistaken for parts of the fœtus ; they do not disappear completely on contraction, and are often rendered more prominent.

If the head happens to be at the fundus, it may be played between the hands, or felt by 'dipping' through the layer of liquor amnii intervening. The small parts (limbs) are felt on the opposite side to the broad, smooth surface of the back.

Movements.—These may sometimes, if the child is vigorous, and the abdominal walls thin, be seen, and this sign might have been included in the evidence obtained from inspection. They may readily, under these circumstances, be felt, and the spot where they are most distinct is almost sure to be that under which the legs and feet lie. This sign, if clearly made out, is absolute evidence of the presence of a living child in the uterus.

3. *Auscultation.*—There are certain sounds to be heard over the uterus of a pregnant woman which are of much importance in the diagnosis of pregnancy.

Uterine Souffle. Uterine Bruit.—This is a blowing noise, synchronous with the mother's pulse. It may be heard over any part of the uterus in a few cases, but is most constantly found in the flanks, particularly in the left one. It is more or less musical, and at times is composed of several notes, which form a sort of chord. If it is listened to during relaxation of the uterus, and contraction then takes place, the pitch of the bruit gradually becomes higher as the contraction reaches its acme, when it becomes almost inaudible, and then, as the uterus again relaxes, the pitch lowers and the bruit returns to its original characters. This peculiarity is best observed, however, during labour. It is first heard about the sixteenth to the eighteenth week, and continues during the rest of the pregnancy, and for some days into the puerperium.

Its cause is not clearly ascertained, but it is in all probability produced by the entrance of the blood from the arteries supplying the uterus into the sinuses in its wall. The sudden change in the shape and volume of the blood-containing passages produces a vibration, which is heard (and sometimes felt) as a bruit. The sudden curves in the uterine and ovarian arteries may also have something to do with the vibration, and the altered quality of the blood during pregnancy is considered by many, and probably with truth, to be an important factor ; at all events, it may intensify a bruit produced by the first-mentioned means.

The bruit can occasionally be arrested by compressing per vaginam the strongly pulsating artery or arteries usually felt in the lateral fornix. A dicrotic bruit has been heard in cases where there was great anæmia. The reason why it is loudest on the left side is no doubt that the left side of the

uterus is usually nearer than the right to the front (dextro-rotation) (see figs. 63 and 64).

The name of 'placental bruit' was given to the sound in past times because it was believed to be produced by the circulation in the placenta. This is, however, not the case, for the bruit can be heard in a certain proportion of cases after the expulsion of the placenta, and is not by any means heard exclusively over the placental site. Thus the uterine bruit is no guide whatever to the situation of the organ, and any attempts to thus localise it in cases where Cæsarian section is to be performed, or where an ectopic gestation is to be operated upon, are quite useless and misleading.

A similar bruit is heard in some cases over fibroid tumours of the uterus, and very rarely in some ovarian tumours. In these cases, however, although in the former disease there is some slight variation of pitch occasionally, there is not the characteristic change above described.

Fœtal Heart Sounds.—After about the eighteenth week the heart of the fœtus can be heard in a large majority of cases over some point or points on the uterine surface. Mayor of Geneva was the first observer who described this. The character of the sounds, when once they have been heard and their peculiarities noted, is unmistakable. The sound is, of course, a double one, but the second sound is very rarely heard. No better description of it can be given than the old one which likens it to a loud watch heard ticking beneath a pillow. It is independent of the mother's pulse, and during examination the finger may be kept on the radial artery of the woman to note this fact. Its rate is about 150, varying in different cases between 140 and 160 as a rule, though it may be slightly faster or slower than these figures. Its rate does not depend as far as has been observed on the intra-uterine age of the child, nor in any definite manner on its sex, though it is true that in a fairly large proportion of cases the rapidity is less in male children than in female. Its rate is influenced by uterine contractions (see p. 106), during which it diminishes: this is probably from pressure, which may act by increasing the arterial tension in the fœtus by compressing the placenta, or by direct compression of the nervous centres in the medulla. It is found to be more rapid when the mother's temperature is higher than normal, and after vigorous movements of the fœtus.

The spot where it is best heard depends on the lie and position of the child. In the commonest relation of the child to the mother—that where the head is downwards, the attitude one of flexion, and the back to the mother's left—the heart is best heard about the middle of a straight line joining the navel to the anterior superior spine of the ilium. The different situation of the spot under different circumstances will be mentioned in the chapters on Labour.

The quantity of liquor amnii has much influence in deciding whether the heart sound is audible or not. If the fœtus does not touch the uterine wall with the anterior shoulder or some part of the body not far removed from the heart, the sound will probably not be heard at all, for a very thin layer of fluid is enough to prevent the vibrations from reaching the stethoscope.

This sound is an absolute proof of the presence of a living fœtus, but its absence at any moment is no proof that there is no fœtus, or that the child is dead. Many pregnancies have been watched through, and frequent attempts made to hear the heart without success, and yet the woman has been

delivered of a living child in the end. At the same time, in any pregnancy, if after a large number of attempts the sound has not been heard, it is, in the absence of other proof that the child is alive, a fair assumption that the child is very likely dead.

Umbilical Souffle.—This is another sound produced by the fœtus. It is synchronous with the fœtal heart, and is heard over the cord. It is without much doubt produced in the cord by compression, either by the stethoscope, or by some position of the cord in relation to the child which leads to stretching. The cord may not infrequently be felt if it lies over the back of the child, and may even be rolled under the finger, and in such a case this sound can be heard. The sound is of a blowing character. It is not of very great value as a sign of pregnancy, since if it can be heard there is other evidence necessarily present of a more unmistakable kind. It occurs in about ten per cent. of all cases.

There are other sounds heard over the abdomen of a pregnant woman—namely, the movements of flatus in the intestines, which may, by the beginner, be mistaken for fœtal heart sounds; and the sounds of the aorta, faintly transmitted through the uterus to the abdominal wall, though it is in most cases the aortic impulse that is felt rather than the sounds that are heard. It is said that the pulse in the epigastric arteries may sometimes be heard, but this must be very seldom. The above sounds are quite independent of pregnancy, though they are heard in the abdomen of a pregnant woman.

A fœtal sound, that of the limbs striking the uterine wall, is pretty frequently heard. It is a faint tap, with which there may probably be felt an impulse through the uterine wall. This is, of course, characteristic of pregnancy.

Under certain circumstances there exist sounds having a pathological origin. The vesicular respiratory murmur has been heard in cases of pneumonia, and is conducted by the uterine wall to the surface from the diaphragm and ribs. Friction sounds between the uterine surface and apposed peritoneal surfaces are described, and must be caused by local peritonitis. Also when air finds its way into the uterus or is developed there by decomposition, it may be heard to move about if the uterus contracts (see p. 502).

4. *Vaginal examination.*—On inspection the colouration and venous congestion already alluded to will be noted at the proper period, and the vaginal walls may be seen to be in folds, protruding slightly in many cases, even in primigravidæ, from the vaginal orifice.

On digital exploration this laxity is very obvious after the sixth month, and the amount of mucus is found to be considerably increased.

The amount of softening and apparent shortening of the cervix in primigravidæ and parous women respectively will be found according to the date (see p. 45).

The amount of enlargement of the uterus belonging to the period of pregnancy will be readily made out bimanually, and bimanual examination will show the presence of contractions before it is possible to observe these by abdominal examination alone.

The globular shape of the pregnant uterus in the early months must be

remembered, and the characteristic way in which the fornices are occupied owing to this change of shape. The uterus is very mobile considering its size, up to the time at which it fills the pelvis completely, and by this mobility it is distinguished from many other enlargements of the uterus or of the organs in its immediate neighbourhood.

The laxity of the lower uterine wall is as a rule well marked in the quite early months.

Ballottement.—A kind of ballottement was spoken of when the abdominal signs were being enumerated, but a more complete example of this can be obtained per vaginam. This sign is produced when the fœtus is tossed up towards the fundus by a movement of the finger in the vagina, and is then felt to fall back on to the anterior uterine and vaginal wall by the same finger.

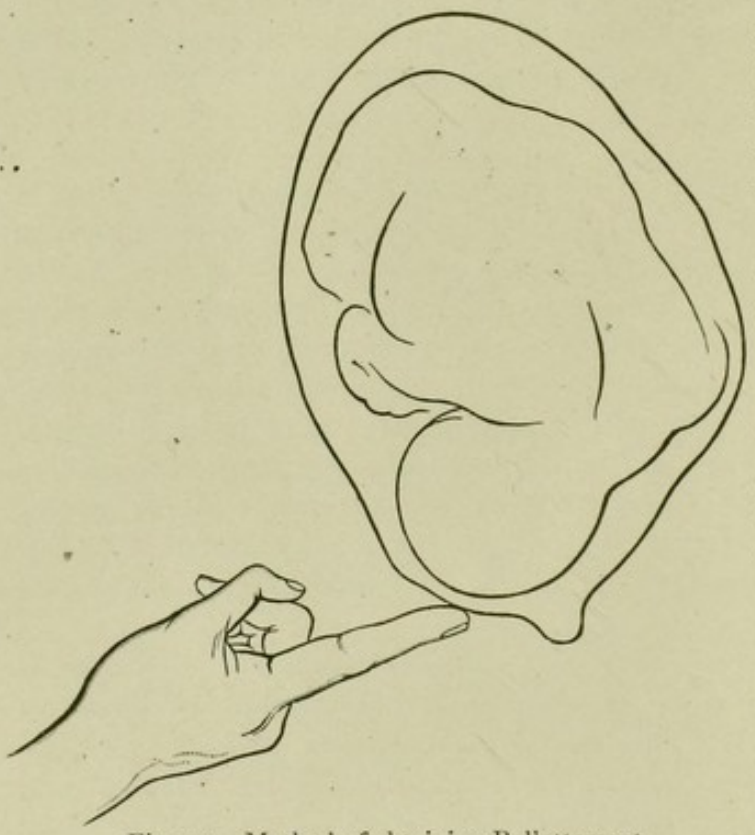

Fig. 72.—Method of obtaining Ballottement.

The woman should lie in a semi-recumbent attitude, as then the uterus will be nearly vertical. The finger is introduced to just in front of the cervix, where there should be something solid felt, the child's head. A smart push upwards is given to this surface, and the finger allowed to remain in the same position. In one or two, or perhaps three, seconds after the impulse, a sensation of something lightly falling on the finger will be felt, or if the fall cannot be actually felt, it will be found that the body which retreated before the finger is again back in the same place. In the case of podalic lie this sign is obscure. The head can be distinctly felt bimanually also.

The date of the first appearance of this sign is dependent on the size of the child compared with the size of the uterine cavity, and also on the weight of the fœtus. The fœtus is too light and too small to give an unmistakable tap on the finger before the fourth month, and it fills the uterine cavity too completely after the seventh month to be displaced far enough. So that the sign is obtainable only from the fourth to the seventh month. Before the fœtal heart can be heard this evidence is most valuable, since it is absolute proof of pregnancy ; for the fact of a solid body of the size of the fœtus lying in a fluid-containing cavity of the size of the uterus is unique. The fallacies which have been mentioned as possible, of a large calculus in a full bladder, or of an anteverted uterus which can be displaced by the finger, are not likely to be misleading. The disappearance of this sign after the seventh month is of no consequence, as more certain signs, such as the fœtal heart, are then to be readily made out.

CHAPTER VII

DIAGNOSIS OF PREGNANCY—*continued*

DIAGNOSIS OF THE DATE OF PREGNANCY AND PROBABLE DATE OF DELIVERY

IT is impossible to fix the date of fertilisation of an ovum, though the date of fruitful coitus may, in a certain number of cases where there is no doubt that only a single act of copulation has occurred, be determined. The reason for this uncertainty is obvious when it is remembered that the moment of rupture of a Graafian follicle cannot be ascertained; that the place at which fertilisation takes place has not as yet been accurately determined; that the rate at which the ovum travels down the tube is not known, nor the rate at which the spermatozoa penetrate the internal genital passages. The spermatozoa may remain in the uterus or tubes of a woman for many days or even weeks in an active condition after insemination, and their contact and fusion with the ovum is possible at any moment after they have obtained entrance.

In consequence of the wide margin of error thus existing, the calculation of the duration of pregnancy can only be approximate. Many observers have tried to find an average period, basing this on the time of delivery after a single act of intercourse. Duncan makes the average 275 days, Ahlfeld 271, Hecker 273·5, Veit 276, Löwenhardt 272, and Stadtfeldt 272 also.

Since it is not unlikely that the ovum escaping at the last menstruation is the one fertilised (though this is almost certainly not invariably the case), and as labour probably most often, if not always, occurs normally at what would have been a menstrual act, the best and most practicable way to determine the date of delivery is to add ten menstrual intervals of one lunar month (twenty-eight days) each—that is, 280 days—to the date of the first day of the last-occurring menstruation.

It can only be said that the pregnancy is more likely to terminate on the day thus calculated than on the one before or after, and on these rather than on days more remote in a backward or forward direction. The method usually employed is to add nine calendar months to (or, what is the same, subtract three calendar months from) the date of the first day of the last menstruation, and to the date thus found to add seven days, so as to make up the 280.

Thus if the last menstruation began on April 5, the day nine calendar months ahead would be January 5, and if seven days be added, the probable date of delivery will be January 12.

In leap year, if February be one of the months included, the numbers are about equalised, but if the year is not leap year, two days must be added for the shortness of February.

This calculation will be seen to be a rough one, but it is quite as accurate as the most elaborate, for emotions or other disturbing causes may pre-

cipitate labour by several days, and in few women is the menstrual interval exactly the same for ten months consecutively. Further, cases have no doubt occurred where the fœtus was retained for some days, or possibly even weeks, beyond the 280 days.

This calculation holds good supposing that the last menstruation is normal, and that it coincides with the beginning of pregnancy. But conception may take place during a period of amenorrhœa, or menstruation may occur during pregnancy (see p. 335), or hæmorrhages, which are mistaken for menstruation, may arise after impregnation, so that the history of this function may be in some cases valueless as a basis on which to calculate.

Another symptom on which women often rely is that of quickening. Its value in this connection has been already discussed (p. 59).

There remain two other ways which are very much more reliable—namely, the determination (1) of the size of the uterus, a method available throughout pregnancy; and (2) of the length of the fœtal ovoid during the later months of pregnancy. The calculation of how far pregnancy is advanced can be made from these data, and the date of delivery approximately determined.

Size of Uterus.—This can be judged bimanually, and to a moderately experienced observer will give a very close approximation to the truth in the early months before the uterus has risen above the level of the brim. After this has happened, the height of the fundus can be defined per abdomen.

Instead of referring the height to the navel and the lower borders of the ribs, both of which points are more or less variable, it is better to measure the height of the fundus above the pubes with a pair of callipers if these instruments are handy.

The following table is given by Sutugin and Galabin:

Weeks . . .	16	18	20	22	24	26	28	30	32	34	36	38	40
Inches above pubes	4	4·7	5·4	6	6·6	7·3	7·8	8·3	8·7	9	9·3	9·6	10

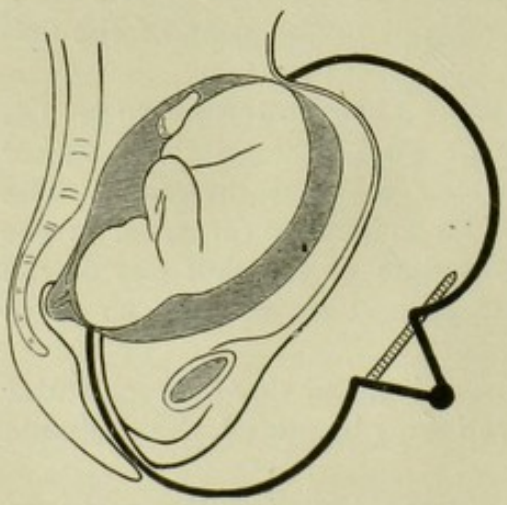

Fig. 73.—Callipers in position.

Care must be taken in using this method that the child is in a cephalic lie, and that the head is in the pelvis to the normal depth (see Contracted Pelvis, p. 427). The urine should be passed or drawn off previous to the measurements being made. The presence of a tumour raising the uterus or displacing it, or the existence of hydramnios or of twins, will of course make this method useless.

Length of Fœtal Ovoid.—This gives the most reliable datum. The fœtus is first to be made out to be in its normal attitude of flexion. One arm of a pair of callipers is introduced into the vagina, and the end placed on the lowest point of the child's head felt through the anterior vaginal wall. The other end is

adjusted to the highest point of the breech on the abdominal wall (fig. 73). The method is equally applicable if the lie be a podalic one.

The following numbers will then be a guide :

Weeks	26	28	30	32	34	36	38	40
Length in inches	7·2	7·6	7·9	8·3	8·8	9·2	9·5	9·7

Diagnosis of Parity or Nulliparity

The determination whether a woman has previously borne children or not rests on the fact that the fœtus produces by its size certain mechanical effects on the walls of the abdomen and of the canal through which it passes in the act of birth. If the ovum of a woman who has been delivered has not been large enough to cause these mechanical changes, it is impossible to be certain as to her parity ; that is to say, it would be impossible in most cases to say for certain that a woman was parous if she had not gone longer in pregnancy than the fifth month or thereabouts.

The signs consist in : changes in the hymen, vagina, and perinæum ; changes in the cervix ; abdominal striæ.

Changes in the Hymen, Vagina, and Perinæum.—The base of the *hymen* is usually accepted as the lower limit of the vagina, and it is in this part of the membrane that the most characteristic alterations occur.

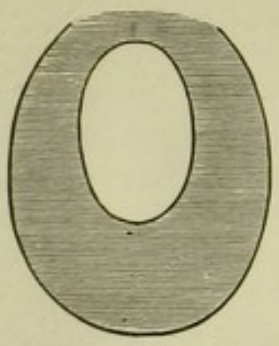

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Fig. 74.—Hymen of virgin.

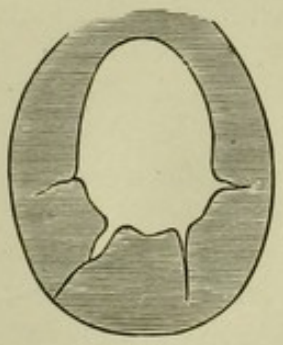

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Fig. 75.—Hymen after connection.

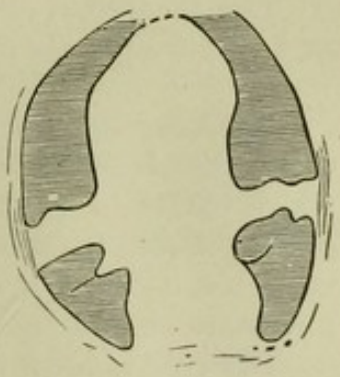

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Fig. 76.—Hymen after parturition.

The membrane itself is usually lacerated at the first intercourse, but this is by no means invariably the case, and a quite appreciable proportion of women who have arrived at the full term of pregnancy are found to have an entire hymen.[1] The tears found under these circumstances merely affect the membrane itself, and do not involve the base at all. The flaps formed by the tearing can be arranged in their proper position, and the membrane thus reconstructed and shown to be complete, though torn (fig. 75).

After parturition the base of the membrane is found to be torn to a varying depth, and the portions of the membrane remaining are seen to be separated by considerable intervals at their attachments, the tissue covering these intervals being cicatricial. The fragments themselves are of irregular

[1] Budin has found an intact hymen 13 times in 75 primiparæ, but this is a far higher proportion than has been found by the writer.

shape and are also more or less cicatrised, and constitute the *caruncul*æ *myrtiformes* (fig. 76).

The *vaginal walls* are lax, their rugæ have almost disappeared, and cicatrices may be present in their substance.

Even after delivery of a full-time child, however, cases are occasionally seen where the hymen remains untorn and the vagina has its rugæ almost as marked as ever.

The *perinæum* is nearly always found to be torn to the extent of the fourchette, though this is not nearly so constant as the laceration of the vaginal orifice. The result of the tear through the fourchette is that the fossa navicularis is obliterated, and there is a more or less plane surface leading out from the vagina on to the perinæum (fig. 78).

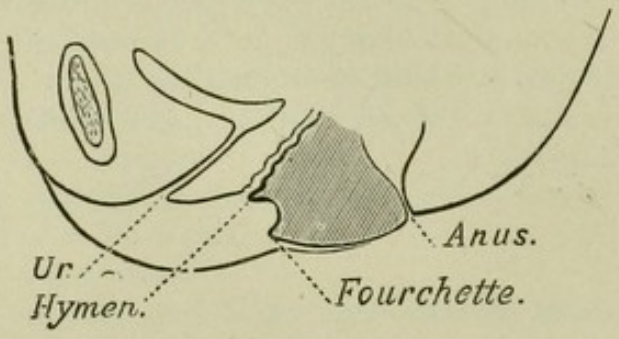

Fig. 77.—Pelvic floor, nulliparous.

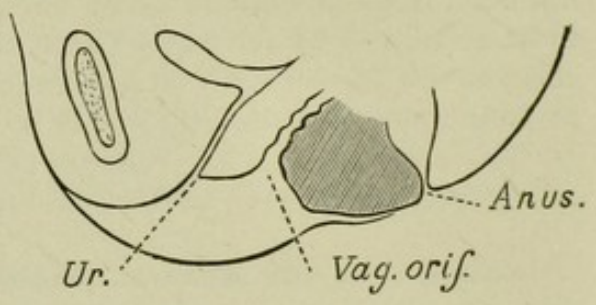

Fig. 78.—Pelvic floor, parous.
(The whole pelvic floor is usually lower than this.

The laceration of the perinæum is sometimes more extensive than this, and very frequently its anterior edge is constituted by cicatricial tissue.

Changes in the Cervix.—This is almost inevitably torn in the passage of the head, and its oval external os is converted into a transverse slit, which varies in extent from a slight widening of the nulliparous os to a gaping mouth reaching from one vaginal fornix to the other. In very rare cases the cervix is not torn, and then it cannot be distinguished from that of a woman who has not borne a child.

The split is most commonly unilateral, or at all events is more marked on one side than on the other. The side affected in a very large majority of cases is the left.

The prevalence of tears on the left side is usually ascribed to the frequency of the first or left occipito-anterior position of the head. As the occiput descends first into the stretched ring of the external os, that side against which it lies will be first torn, for the opposite pole of the head, the frontal, is stretching the canal of the cervix at a somewhat higher level than the extreme margin, and thus does not tear the tissues so readily, for they are thicker, and there is no thinned edge in which the tear can begin (fig. 127).

This is a probable explanation, but is not true of all cases, as the author has often found a split in the left side only of the cervix when the head has descended in the second position ; and, conversely, a split in the right side only after a labour with the occiput to the left.

If the split is an extensive one, reaching to or nearly to the vagina on each side, the two lips may be found to be everted, in a state of ectropion. This deformity is due partly to glandular overgrowth on the inner aspect of

the lips owing to chronic cervical catarrh, and partly to the action of the muscular fibres on the outer aspect of the lips (see p. 42).

The cervix is also sometimes torn in a radial manner, some of the intervals between the segments being deep and some shallow ; the lobes thus produced sometimes hypertrophy, and convert the vaginal portion into a somewhat irregular mass.

Abdominal Striæ.—These are almost invariably found to follow a pregnancy which has advanced to the later months. They may be produced, however, by any condition which pretty rapidly stretches the abdominal walls, such as quickly developing ascites or rapidly growing ovarian tumours ; and, as has been mentioned, they are found on the breasts in cases where these organs have developed at puberty with some rapidity, and over the hips when these have widened at the same epoch.

The difference in appearance between old and new striæ has been alluded to.

Attention may be directed to the general condition of laxity of the abdominal walls and the mammæ in women who have borne and nursed a child, though these changes are by no means constant.

Some increase in the size and weight of the uterus on the vaginal and bimanual examination can nearly always be made out by an experienced observer.

Differential Diagnosis

The symptoms and signs of pregnancy have been fully discussed and the fallacies to which they are liable. It will have been learned that the symptoms are only suggestive, and by themselves are not enough to form an opinion upon. Taken together, however, especially where there are no psychical or social circumstances likely to distort the view presented to the medical man, they are of considerable value.

The absolute signs of pregnancy need not, of course, be discussed.

If the pregnancy is a normal one, there should not be much doubt as to the diagnosis by the time the uterus has reached the level of the navel ; but before this, and particularly while the uterus is still a pelvic organ, mistakes are very frequently made.

The subject may be divided into—(*a*) The diagnosis of pregnancy in the first three months, and (*b*) its diagnosis during the last six months. In this latter group pregnancy may have to be distinguished from a general abdominal enlargement, or from an intra-abdominal mass which resembles the pregnant uterus.

The rate of growth of the pregnant organ must be remembered always, and any tumour which increases at the same speed is more likely to be the gravid uterus than anything else. If there is no urgency about the case, this sign can always be obtained by a few weeks' waiting.

First three months.—The symptoms of pregnancy may be marked ; or may be absent or modified in various ways.

Enlargements of the Uterus.—Fibro-myomata. These may occasionally

resemble the gravid uterus, in their shape and sometimes in their consistency. There is sometimes a souffle, and there is often softening of the cervix (p. 46). It is well to mention here that there are occasionally lumps found on examination of the pregnant uterus, which may be mistaken for fibroids in its walls, but which are only temporary local contractions. These may lead to mistakes if they are not remembered.

The distinction lies in the usually irregular shape of the uterus affected with fibroids; the surface irregularities; the absence of contractions in anything like the degree natural to the pregnant organ; and in the rate of enlargement of a uterus, which is very much slower than in pregnancy. If the ordinary symptoms of fibroids, menorrhagia and discharge, are present, they will be of much value.

2. Hæmato-metra, due to retained menses. The resemblance lies in the amenorrhœa, accompanied with an abdominal tumour of the shape of the enlarged uterus.

The distinction lies in the fact that the patient has never menstruated, although she may be well over twenty years old, and has no general illness to account for the amenorrhœa; that the tumour increases very slowly, and that there are, as a rule, at monthly intervals, signs and symptoms that menstruation is going on, although there is no external show.

3. Subinvolution.—The uterus is large, and the woman may have amenorrhœa from anæmia, or she may be nursing.

The uterus does not increase in size; its texture is not that of the pregnant uterus, but inelastic. Its shape is not at all globular, but merely that of the unimpregnated uterus enlarged; and there are no contractions to be felt under any circumstances.

Tumours outside the Uterus.—Among the tumours which may be confused with pregnancy are small ovarian cysts; distended tubes, especially if they are adherent to the uterus and move with the cervix; ectopic gestations; encysted peritonitis. It must not be forgotten that intra-uterine pregnancy may co-exist with ectopic gestation and with ovarian tumours, and that in the case of intra-uterine pregnancy, the uterus may be retroverted or flexed or both, and appear as a tumour in the pouch of Douglas.

Last six months.—During this period the diagnosis will be easier, as there will be some of the absolute signs of pregnancy to be found. The conditions from which pregnancy may have to be distinguished include fibroids; ovarian tumours; distension of the bladder; and possibly renal, splenic, or other masses.

If contractions are felt in any tumour, it is quite certain that it is the pregnant uterus.

Collections of fat in the omentum and abdominal wall have sometimes given rise to mistakes, and flatus and masses of fæces might do so. Such mistakes are most likely to happen towards the end of menstrual life, and especially in women who have had no children, and are anxiously noting every appearance which might suggest pregnancy. If, at the same time, menstruation is omitted occasionally, as happens frequently about the menopause, their suspicions are strengthened. About this time, the phenomena known as *Phantom Tumours* are not uncommonly found in women who are watching

with such anxiety. These consist of irregular muscular contractions in the abdominal walls, or collections of gas in sections of intestine, and either of these conditions may give the impression of a definite tumour. Little or no difficulty is, however, likely to arise in connection with a phantom tumour; for on applying the usual tests of percussion, auscultation, and so on, its nature will become evident; and, in any case, an examination under an anæsthetic will clear up the doubt.

Spurious Pregnancy. Pseudo-cyesis.—It is occasionally found that women imagine themselves pregnant when they are not so; and in some cases certain of the symptoms characteristic of pregnancy are present, and may be accompanied by physical conditions which appear on a superficial examination to confirm this idea. Such a state of things is most common about the time of menopause, especially in childless women who are anxious to become mothers, but the mistake is not confined to such women. It is rather a delusion than a mistake. A careful examination, under an anæsthetic if necessary, will at once make the matter clear; and it may be easy, or the reverse, to persuade a patient she is not pregnant. Women have been known to persist in this idea for several months beyond the time at which, according to their own calculations, delivery should have occurred, and in a few cases have gone through a spurious labour.[1]

In one class of case there are no symptoms present, except those of imaginary fœtal movements, due, of course, to flatus; in another class, as pointed out by Matthews Duncan, vomiting, mammary changes, and other symptoms may be present. In neither class do supposed fœtal movements fail to appear.

Diagnosis of Life or Death of the Child

In a case in which the fact of pregnancy has been established, the question may arise as to whether the child is alive or dead.

The woman may suspect the death of the child on account of certain feelings of weight or coldness over the pubic region, as these sensations are considered by those well informed to be signs of death of the ovum; or she may cease to feel the movements of the fœtus; or her breasts may become flabby.

It is not always easy to settle that the child is dead. If it is felt to move by the medical man, or he hears the fœtal heart, he can give a certain negative answer; but his not hearing the fœtal heart at one or two examinations, nor feeling movements, are not sufficient grounds upon which to make a diagnosis.

The matter can only, as a rule, be settled after several examinations have been made, and after some weeks have elapsed. If the heart and movements of the child cannot be perceived on several occasions at intervals of a week or so, if the uterus ceases to grow and the breasts become flabby, and the congestion of the lower end of the vagina, though this is a sign of no great value, diminishes or disappears, it may fairly be inferred that the child

[1] A case of spurious labour is well described in the *Obstetrical Transactions*, vol. xxvii. p. 326, by H. Roxburgh Fuller, M.A., M.B. In the discussions on this paper a case was mentioned by Galabin.

is dead. If decomposing parts of the child come away from the uterus, or are felt through the cervix, there is, of course, no doubt.

(For the diagnosis of molar pregnancy, see p. 248.)

Scheme for the routine Examination of Cases where Pregnancy is supposed to exist

History.—Individual type of menstruation. Whether the patient menstruated irregularly before cessation; whether in previous pregnancies she menstruated once or more after impregnation.

Any peculiarities in previous pregnancies or labours.

Symptoms.—Date of occurrence of vomiting; quickening.

Physical Signs.—1. Size and shape of *abdomen*; *Striæ*.

2. *Height of fundus* above pubes; *shape* and *position* of tumour; *surface* and *consistence* of tumour; *contractions* in tumour; fœtal parts, and lie, attitude and *position* of fœtus in utero if they can be made out; *external ballottement*; *percussion*; *thrill* (palpable uterine bruit). *Breasts*, size; areolæ; nipples; secondary areolæ; secretion. *Skin* generally; pigmentation.

3. *Auscultation.*—Bruits; fœtal heart; intestinal and other sounds.

4. *Cervix.*—Position in pelvis; relation of axis to that of pelvis; mobility; softening; lacerations; erosions; patency.

5. *Vaginal walls*;—secretion.

6. *Fornices*;—resistance, tumours; lateral bulging of uterus.

7. *Body of Uterus*, examined bimanually;—mobility; size; connection of tumour felt per abdomen with cervix; contractions; regularity of shape; position in pelvis and abdomen (versions, flexions, lateral displacements, rotations); *pouch of Douglas*, resistance; contents.

8. *Inspection of Vulva*;—blueness or discolouration; varicose veins; discharge.

9. Perinæum; fourchette; hymen.

10. Bladder (catheter if necessary).

CHAPTER VIII

MULTIPLE PREGNANCY

UNDER this heading cases of multiple pregnancy *in utero* only will be considered. Two or even more ova may develop simultaneously, one or perhaps two in the uterus, and the other in the Fallopian tube; but ectopic pregnancies, as those occurring outside the cavity of the uterus are named, will be treated of elsewhere.

The occurrence of twins or triplets is nothing abnormal, and must be looked upon as merely a variation.

Frequency.—Multiple pregnancy occurs mostly among races which are more than usually fertile. For instance, in Ireland twins are found to be born once in sixty labours, whereas in France the average is once in eighty or thereabouts.

Taking all statistics together, triplets appear once in six or seven thousand, and the birth of four or more children is an event of great rarity.

Heredity seems to be a powerful factor in the causation of multiple pregnancy, and shows itself on the mother's side more especially. More twins are born at a first pregnancy than at any other, especially in elderly primiparæ ; but in after-occurring pregnancies the tendency increases with the number of pregnancies.

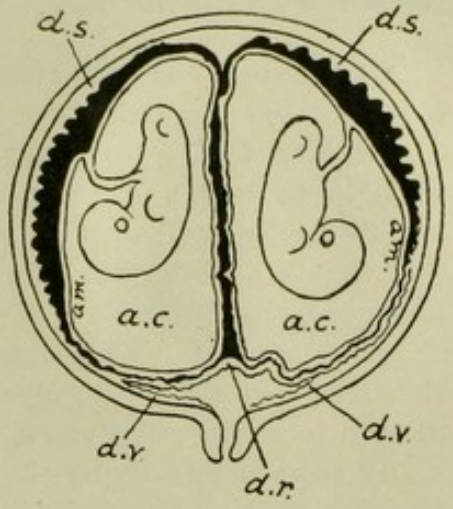

Fig. 79.—Twins : 1. *d s*, decidua serotina ; *d v*, decidua vera ; *d r*, decidua reflexa ; *am*, amnion ; *a c*, amnionic cavity. The heavy black area = chorion.

Mode of Origin.—Twins may arise in three ways ; they may be developed from—

1. Two ova, from the same or different Graafian vesicles and from the same or opposite ovaries.
2. One ovum with two yelks (see figs. 13 and 14, p. 8).
3. One yelk with two embryoes.

The accompanying diagrams (figs. 79, 80, 81) show how the membranes and placentæ are arranged under each of these methods.

As the pregnancy advances, the decidua and the chorion between the embryoes in many cases fuse or are partially absorbed ; thus, where there were originally two separate decidual sacs, these become converted into one, and the same result may occur in the case of the chorion. The amnionic partition is probably much less frequently absorbed : this, however, must occasionally happen, though it is difficult of proof.

The fertilisation of the two ova or embryonic cells does not necessarily take place at the same coitus, and twins have been born, one of which was

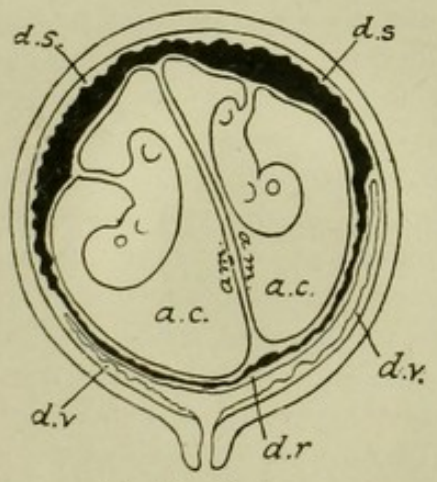

Fig. 80.—Twins : 2.

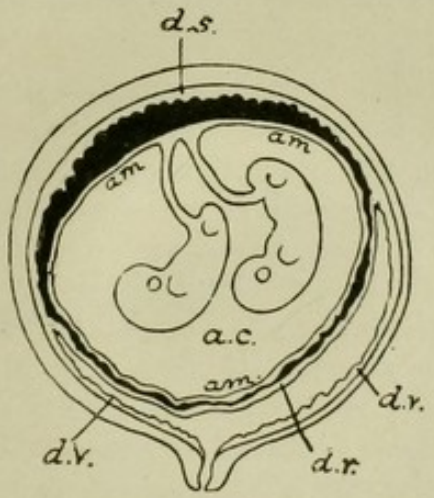

Fig. 81.—Twins : 3.

d s, decidua serotina ; *d v*, decidua vera ; *d r*, decidua reflexa ; *am*, amnion ; *a c*, amnionic cavity. The heavy black area = chorion.

black and the other mulatto, and so on. This non-simultaneous *fertilisation* is called superfecundation.

Here the two ova *develop* simultaneously, and unless there have been two fathers of differing colour, superfecundation cannot be proved. In the condition known as *superfœtation*, where the fœtuses are not of the same

degree of development, it is sometimes more easy to show that the fertilisation of one ovum must have occurred before that of the other (see p. 76).

Triplets seem to be developed from two ova, one of which was double-yelked.

Characters of individual Children.—The case of twins only is considered ; but the same laws hold good in the case of larger numbers.

Sex.—There is not much departure from the ordinary relative numbers of each sex born ; it is found according to some statistics that the children are oftener of the same sex than of different sexes, and according to others that they are oftener of different sexes.[1] Double monsters are always of the same sex.

Development.—Twins are almost always smaller when born than single children, and this is to a great extent because labour is so often premature ; though it is true even when the pregnancy goes to term.

In triplets this under-development is still more common, and it seldom happens that all three children survive.

Twins are unequally developed as a rule. This may be due to the more favourable implantation of the placenta of one of the children or to original superiority. If one fœtus is much stronger than the other and grows faster, the weaker one is sometimes compressed to such an extent that it finally dies, and becomes converted into a *Fœtus papyraceus*, being flattened out between the growing child and the uterine wall, and dried up into a mummy. Putrefaction does not occur, for no air is admitted.

If one embryo dies early from some damage to the ovum or decidua serotina (see p. 248), the ovum to which it belongs may be converted into a mole.

Such a dead ovum or a fœtus papyraceus may by acting as a foreign body set uterine contractions going, and then it alone, if the membranes of the two ova are separate, may be expelled, the healthy ovum being retained ; or both fœtuses may be aborted (see remarks on Double Uterus).

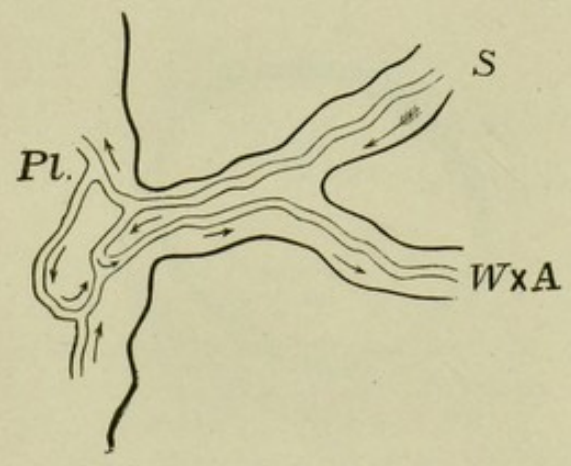

Fig. 82.—Scheme of arterial circulation in the cords and placenta in the formation of an acardiac fœtus. *Pl*, placenta ; *S*, stronger fœtus ; *W* × *A*, weaker and acardiac fœtus.

Acardiac fœtus.—If, in cases where the vessels of the two placentæ intercommunicate, or where there is a common placenta, one fœtus is much stronger than the other, the heart of the stronger child raises the blood pressure higher in its own vessels than that found in the vessels of the weaker child. In consequence the blood is forced towards the heart of the weaker one through the incommunicating vessels. After a time the heart of the weaker child, being over-distended by this means, gives out, and its muscle atrophies. The heart of the stronger child then carries on the circulation

[1] Galabin gives as the result of an examination of the statistics of the Guy's Lying-in Charity, that in 38 per cent. both were males, in 34 per cent. the sexes were different, and in 28 per cent. both were females.

of both fœtuses (fig. 82). Naturally the weak fœtus gets a very imperfect blood-supply, and those parts which are supplied by the vessel nearest the point of entrance of the umbilical arteries into its body (the current in the umbilical arteries being here reversed) have the best supply. So that the lower limbs, supplied by the iliac arteries, into which the reversed current is first poured, are the best developed part of the weak child's body, the head and upper part of the body being very imperfectly nourished. This state of affairs exists in varying degrees in different cases, and varying degrees of deformity are produced, for a description of which the reader must consult works on teratology (fig. 83).

The imperfectly formed fœtus is named a Fœtus acardiacus.

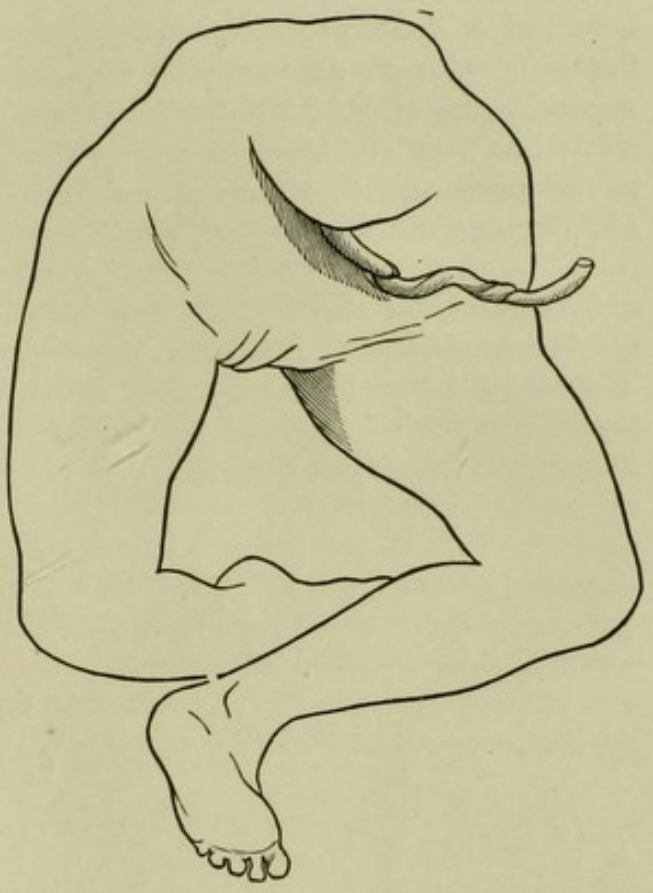

Fig. 83.—Acardiac fœtus. (St. George's Hospital Museum.)

Symptoms. Diagnosis.—The only *symptoms* noticed are that the abdomen is larger than usual at a given date of pregnancy, and that pressure symptoms arise sooner and are more severe than in single pregnancy. Labour is, as has been said, often premature (in about 20 to 30 per cent.).

The *diagnosis* of twin pregnancy is made by palpation and auscultation. Two heads may be recognised, and this will be usually the easiest way, or the whole outlines of two bodies may be felt. The two heads may both be in the pelvis, or one may be in the pelvis and the other at the fundus.

Two fœtal hearts, not beating synchronously, may be heard. The two hearts may be made out by two observers listening at different points of the uterus, each stethoscope being over a different child. One observer lays his hand down and the other taps upon it in time with the pulsations of the heart to which he is listening, and the first named notices whether the beats coincide or not with those of his side. Or a double binaural stethoscope may be used, one chest-piece being applied to one part of the uterus and the other to another part.

The two conditions most likely to be mistaken for twins are Hydramnios (see p. 257) and a large single fœtus.

Double Uterus.—Twins or triplets may be developed in the two halves of a double uterus (see p. 294). In such cases it is not unlikely that one child may be born before the other or others, this interval occasionally extending to several weeks. In such circumstances the last-born child will be of larger size and fuller development than the earlier one.

Superfœtation.—This has been defined in mentioning superfecundation (p. 73). In cases where the simultaneous birth of two children of different degrees of development, or the birth of two children of the same degree of development at different times, cannot be accounted for by one fœtus having obtained all the nutriment, it is probably explained by the presence of a double uterus. Spiegelberg says that the possibility of superfœtation rests on an exploded hypothesis, namely that of fertilisation of a second ovum after pregnancy has already commenced.

It has been supposed to be possible because, as will be remembered, up to the fourth month of pregnancy there is a space between the decidua vera and decidua reflexa, through which spermatozoa *might* pass to the Fallopian tube. A case in support of the hypothesis is recorded ; namely, one where a five-months' ectopic fœtus has been found with a three-months' intrauterine pregnancy. Here the worse-placed fœtus is the better developed. This case, however, would only prove that ovulation during pregnancy, a possibility denied by most, may occur under pathological conditions. The question is not as yet settled.

CHAPTER IX

HYGIENE OF PREGNANCY

SINCE pregnancy is a purely physiological state, there would seem to be little to be said on this head. But as few women are without some weak point in their constitution, care should be taken to keep every pregnant woman up to as high a pitch of health as possible, so as to enable her to bear the strain of parturition and lactation.

Serious deviations from health will be considered in the chapters on the Pathology of Pregnancy.

The general rules to be observed are as follows :—

Exercise.—This should be continued during the later months of pregnancy, though anything like over-fatigue should be avoided, and exertion in the way of lifting weights or making prolonged efforts must be forbidden. Although the woman may prefer not to show herself much in public, a short walk every day must be obtained, unless there is any contraindication.

The various functions of the body must be kept in order, especially the action of the *bowels*, which is the one most liable to cause trouble. In most cases a gentle laxative, where the usual tendency to constipation exists, is enough, and strong purgatives must always be avoided. Tight *clothing* of any kind is most undesirable, and this especially refers to corsets. Some women wear these as tight as possible so as to conceal the enlargement of the abdomen, but the movements of the thorax are then interfered with, and the venous congestion found in all pregnant women to some degree is much

increased. This may cause damage to the pelvic organs, and to the tissues of the decidua and ovum.

The *nipples*, especially in primigravidæ, must be attended to during the last months of pregnancy. Pressure on them should be avoided, and they may with great advantage have their epithelium rendered tougher by bathing them with a weak alcoholic solution, such as eau-de-Cologne and water, daily. They should be kept scrupulously clean, and the dried secretion which collects on their summits softened and wiped away, as there is a great likelihood of the epithelium beneath these crusts becoming atrophied, and a sore will then readily form if they are at all hardly used by the child during the first days after its birth, before the flow of milk is fully established.

Excitement in women who are ready to abort on small provocation is to be especially shunned. If a woman becomes pregnant while she is *nursing* she should wean her child, since the irritation of the nipples may lead to sufficiently energetic uterine contractions to start labour. Coitus must be indulged in to a very restricted degree, especially in the later months.

It is well for the medical man to examine the woman's abdomen at least once towards the end of pregnancy, as he can thus detect any abnormality in lie or position, and, if necessary, correct this by external manipulation before labour begins. It will, of course, be borne in mind that the fœtus is constantly changing its lie during the middle months, and not infrequently does so even after the seventh month. In the last week or two the lie and attitude remain constant as a rule, and it is then that observations are of the most use.

LABOUR

CHAPTER X

DEFINITION OF LABOUR[1]

LABOUR is the process by which the ovum and decidua are detached and expelled from the body of the mother.

Three factors combine in this process—namely,

A. The expelling force ;

B. The passage through which expulsion is effected ;

C. The body to be expelled.

The mechanism of labour consists in the results of mutual reactions of A, B, and C.

Before considering these factors and their relations to one another in detail, the following propositions may be stated ; they briefly epitomise the more important processes of labour :

Fig. 84.—The two ovoids of the fœtus.

1. The expelling force is made up of several components ; the resultant of these at any given moment, however, must act in the direction of the axis of the passage.

2. The passage through which expulsion proceeds is a short irregular tube with a bent axis (see fig. 87). The walls of this tube vary in rigidity at different cross-sections, and the shape of its cross-section varies at different points along its length in a definite manner (see figs. 91, 92, 93).

3. The body to be expelled (considering here the fœtus alone) consists of two ovoids, as shown in the diagram—the trunk, and the head, connected by a joint which allows of almost 'universal' movement. Of these two ovoids the former is very plastic, the latter comparatively rigid. On this account the relations of the head to the passage are more important than those of the trunk to the passage.

4. The fœtus can only pass through the tube with a squeeze, fitting it very closely under the most favourable condition ; that is, when the longest axis

[1] When the term 'labour' is used without any qualifying adjective, it is understood that 'labour' at or near full time is meant.

of either of the two ovoids of the fœtus coincide as nearly as possible with the axis of that part of the tube which either ovoid is occupying.

5. The long axes of the two ovoids respectively are almost at right angles to one another when unrestrained. This holds good whether the fœtus be looked at in elevation (fig. 84) or in plan (fig. 85).

6. As these ovoids pass through the tube they each tend to place their longest axes where there is most room for them.

The axes seen on looking at the fœtus in elevation tend to coincide with the axis of the tube, and the longest axes as seen in plan (these are nearly in the plane of that cross-section of the tube in which they happen to lie) tend to move into the longest diameter of that cross-section.

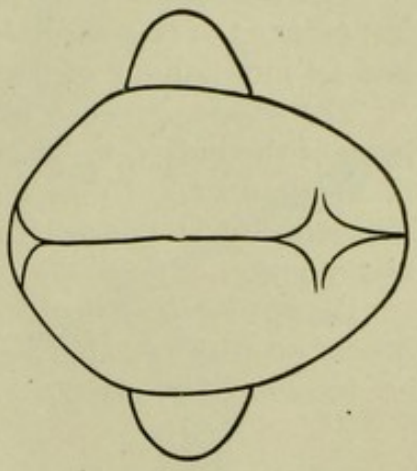

Fig. 85.—Fœtus in plan.

7. Bearing the irregularity of the tube in mind, it will be seen that the position of some of the axes of the ovoids with reference to the walls of the tube must be constantly changing during the progress of the former through the tube. Now these movements constitute the mechanism of labour.

The expulsion of the placenta and membranes is really part of the mechanism of labour. It is, however, a comparatively simple matter.

Anatomy of A, B, C

A. **Expelling Force.**—The anatomy of the main expelling agent, the uterus, has already been considered under Pregnancy, together with those modifications in the vagina and round and broad ligaments which occur in the gravid woman. The auxiliary muscles of labour, those which act by diminishing the size of the abdominal cavity—namely, the diaphragm and the muscles of the abdominal wall—need not be described here in detail as regards their anatomy; their action will be treated of later. The muscles and fasciæ of the pelvic floor act in two ways; at one period they form part of the pelvic resistances, and at a later moment they act as components of the expelling force. They will immediately be described as forming part of the parturient passage.

B. The passage through which expulsion is effected is formed of the bones and soft parts of the true pelvis.

General Description of the Parturient Canal

The maternal passages in the parturient condition have already been alluded to as forming a short tube. This tube has unequal sides; posteriorly its length corresponds to that of the vertical measurement of the sacrum plus the length of the coccyx and the stretched pelvic floor,[1] while anteriorly the tube is only as long as the symphysis is deep.

The upper part of this tube is bony and therefore rigid. The lower part

[1] For definition and description of the pelvic floor see p. 86.

is yielding as to its posterior wall, owing to this being made up of muscle and other soft structures.

The transition between these two parts does not occur at a definite line, but extends over a short length where there is an external sheath of bone and an internal one of muscle and fascia (fig. 86).

The upper entrance of the tube corresponds with what is known as the brim of the pelvis, to be presently described. Below this, as far as the origin of the levator ani muscle, the tube is rigid. Below this again, the lateral extensibility is limited by the tubera ischiorum which form the lowest continuation of the bony canal, and provide the bony outer sheath spoken of.

Except for this transition space the tube below the 'white line' above described is distensible posteriorly and laterally to any required extent, both on account of its elasticity and its capability of being torn. The coccyx may

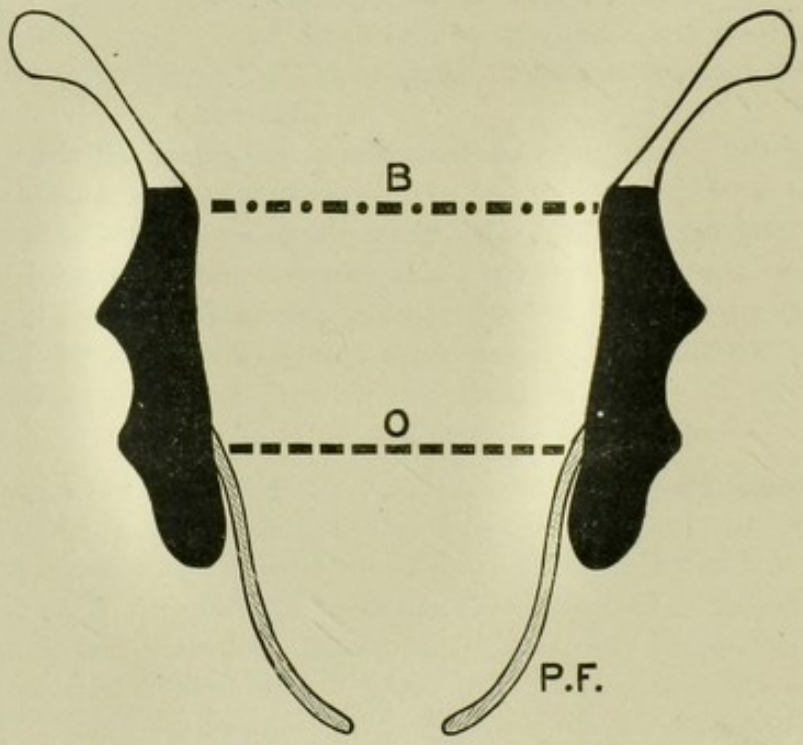

Fig. 86.—Diagram of parturient canal, coronal section. *B*, brim; *O*, outlet, corresponding to the 'white line;' *P F*, pelvic floor.

be neglected as a bone affecting parturition as long as it is not rendered immovable by anchylosis of its joint; it forms merely an ossified intersection between the posterior parts of the levatores ani.

Axis of the Tube (A, fig. 87).—The axis of the tube has been spoken of as a bent one. In defining the term 'axis,' as applied to the female pelvis, it is of no use attempting to do so in a way which will satisfy mathematical requirements, for the walls of the canal are so irregular that they by no means enclose a cylinder. The most practical definition of the axis in this case is as a line describing the path of the centre of a spheroidal body, such as the fœtal head, in its passage through the genital canal, it being understood that such spheroidal body fits fairly tightly the tube at every part. This line will join the centres of a series of planes, each of which lies within a line marking the girdle of contact between the body and the tube at any stage of the former's progress.

From the brim down to the 'white line' of the pelvic fascia the path of

such a body would be nearly a straight line, but here the direction would change to one lying at about a right angle to the former one, since the anterior wall terminates at this level, and the forward pressure of the pelvic floor on such a body as the fœtal head is then unopposed. The shape of the walls of the tube, both bony and elastic, which bring about the particular character of its axis is seen in the diagram (fig. 87).

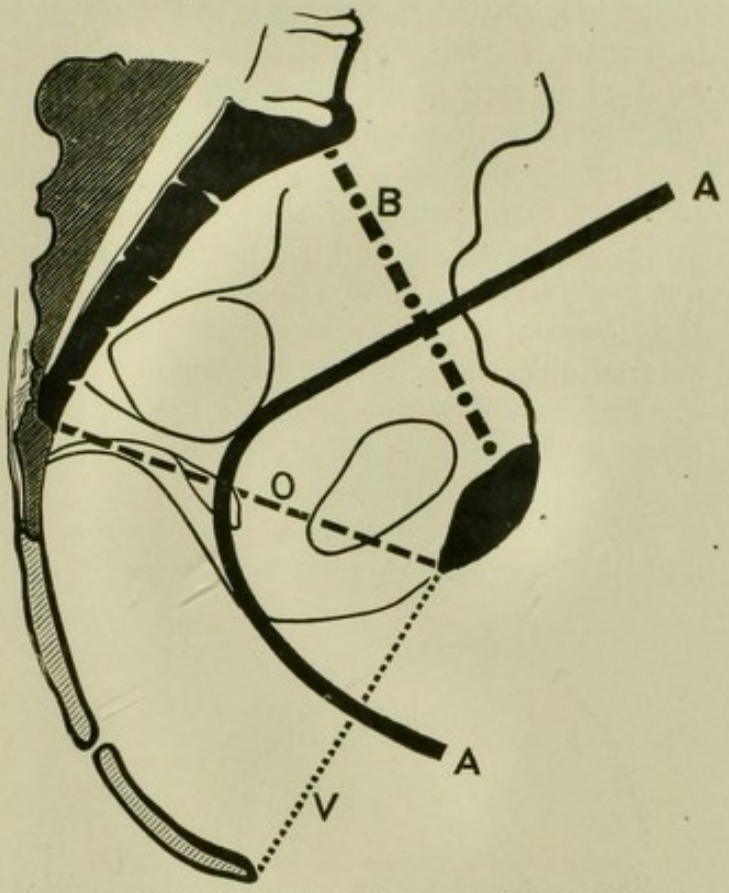

Fig. 87.—*A A*, axis of parturient canal; *B*, brim; *O*, outlet (tip of sacrum to lower edge of symphysis); the coccyx is shaded somewhat lighter; *V*, vulvar orifice expanded.

Bony part of the Canal. This consists of the true pelvis only, as the part above the brim has nothing to do with labour. No description will be given here of the detailed anatomy of the several bones, but those parts alone will be mentioned which have a direct bearing on the present subject.

The *brim* of the pelvis, already alluded to as the upper entrance of the tube, corresponds to a line which, starting from the promontory of the sacrum, is continued forwards by the upper and anterior border of the ala of the sacrum and the ileo-pectineal line, and ends at the upper border of the symphysis by joining a corresponding line on the opposite side.

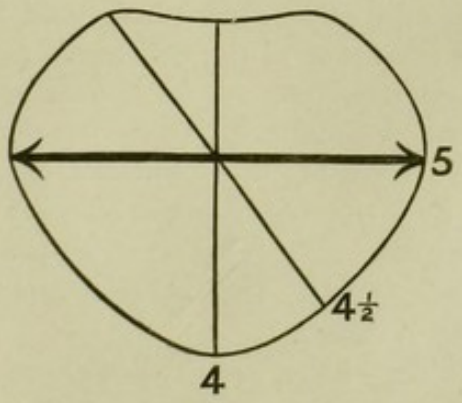

Fig. 88.—Brim of pelvis.

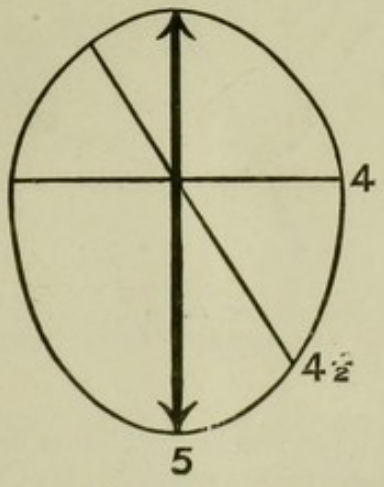

Fig. 89.—Outlet.

The brim has an elliptoid shape, as is seen in fig. 88; its antero-posterior flattening being accentuated posteriorly by a very slight convexity forwards caused by the projection of the promontory of the sacrum.

The *outlet*, or lower end of the bony tube actually concerned in labour (figs. 86, 87, and 89), and corresponding to the 'white line,' has an elliptoid shape too, but the flattening is in the transverse diameter. The line bounding it begins posteriorly at the lower end of the sacrum, runs along the lesser sciatic ligament to the spine of the ischium, and is continued forwards, cutting the obturator foramen, to the lower border of the symphysis (see fig. 87).

The plane lying within this line is known as the 'middle strait,' the brim forming the 'upper strait.' The 'lower strait' is sometimes called the outlet of the pelvis, and lies between the tuberosities of the ischium laterally, but has the same antero-posterior boundaries as the 'middle strait.' With the 'lower strait' normal labour has nothing to do, and it has to be considered only when labour in deformed pelvis is in question.

The *cavity* of the pelvis is the part of the tube which lies between the plane of the brim and that of the outlet, or middle strait.

Its walls are formed as follows :—

Posteriorly, by the sacrum. This bone has a moderate concavity forwards, and its curve is subtended by a chord of about 4 in., the curve being deepest at the junction of the second and third sacral vertebræ. Down to the junction of these vertebræ the general curve of the sacrum is very flat, and this has the effect of making the pelvic axis of the part of the tube above this level straight also. Below this level the surface begins to curve forwards, and the axis then tends slightly in the same direction (see fig. 87).

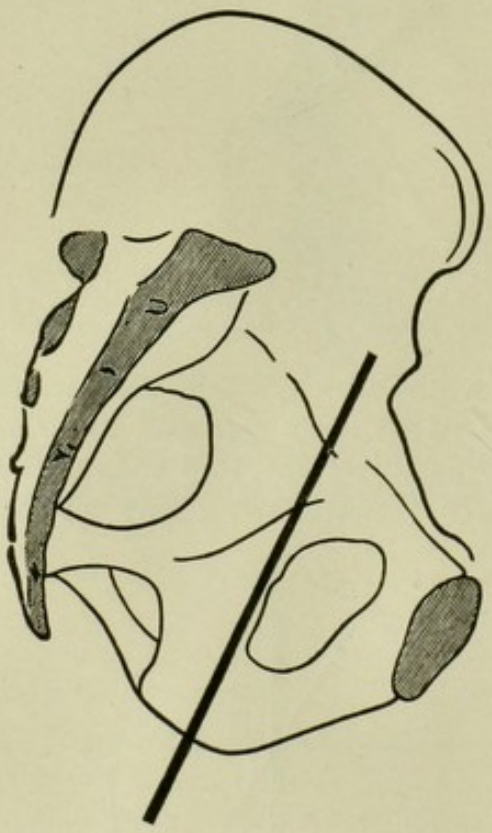

Fig. 90.—Internal surface of pelvis. The line divides the anterior from the lateral wall. The so-called 'inclined planes' are indicated.

Laterally (fig. 90), by that part of the ischium and pubic bone lying behind the obturator foramen and by the sacro-sciatic ligaments.

On this wall there exists a ridge of bone formed by the inclination to one another of two bony planes. This ridge, often difficult to define, runs from just below the pectineal eminence downwards and backwards to the spine of the ischium.

The planes, one on each side of this ridge, face respectively, the posterior one upwards, inwards, and backwards; the anterior or lower one downwards, inwards, and forwards. The posterior slopes into the sciatic notch, the anterior into the obturator foramen.

These 'inclined planes of the pelvis,' as they have been called, have been thought by some authors to have great influence in the rotations of the fœtal head. We shall see immediately that when the pelvis is clothed with muscles these planes are buried under the muscles, and cannot therefore influence the head, unless the pressure on the covering muscles is so great that their padding action is destroyed and the bony surfaces beneath assert

themselves. The occasions on which this close fit may arise will be mentioned later (p. 145). We shall see also what is a far more striking proof of their non-effect in causing rotation—namely, that rotation frequently occurs in an opposite direction to that which the action of the planes would produce. What is expected of them by those who still believe in their importance is that, as the head lies obliquely in the cavity, and one of its poles is resting on, say, the posterior plane of the right side, and the opposite pole on the anterior plane of the left side, that the left-hand pole will glide along its plane into the sciatic notch, and the right-hand one along its plane into the obturator foramen.

Anteriorly (fig. 90) the wall is formed by the pubic bones and obturator membranes.

Pelvic Measurements.—The pelvis has certain measurements of great importance in their relation to the fœtal head, and these are for practical purposes the same in all normal specimens.

The more important of the measurements are those of different diameters of the planes already referred to—namely, the brim, and the middle strait or outlet. A third plane is added, that of the cavity, and certain external and other internal measurements are also of value.

Brim.—Three diameters are taken in the plane of the brim : an antero-posterior or conjugate (the smallest diameter of the elliptoid of this plane), a transverse, and an oblique diameter.

The conjugate is the line joining the middle of the promontory of the sacrum to the upper edge of the symphysis pubis. The upper edge, however, is somewhat everted, and does not come into relation with the head in labour. The point that is taken in practice as the anterior end of this line is a little below the edge, and is really the nearest point on the symphysis to the promontory, and the diameter thus obtained is called the obstetrical conjugate, or conjugata vera. The first described one is the anatomical conjugate.

The Conjugata Vera (fig. 91) measures $4\frac{1}{4}$ in., taking the average of a very large number of pelves. It will be found convenient, for the sake of getting a whole number to deal with, to call it 4 in.

There is another measurement taken from the promontory which is of great importance, as it can be taken during life, and is a means, when obtained, of arriving at a sufficiently accurate conclusion as to the measurement of the conjugata vera. This is the Diagonal Conjugate ; it lies between the promontory and the lower edge of the symphysis pubis. Its length is about $\frac{3}{4}$ in. more than that of the conjugata vera ; and so when the conjugata diagonalis has been made out in the manner to be described later, the conjugata vera can be deduced from it by subtracting $\frac{3}{4}$ in.

The Oblique diameter is taken from the point on the line of the brim marked by the sacro-iliac synchondrosis, to the pectineal eminence of the opposite side. There are of course two, and they are named right and left respectively, according to the sacro-iliac synchondrosis from which they start. They measure $4\frac{1}{2}$ in.

The Transverse diameter lies between the middle points of the two ileo-pectineal lines, and is the widest diameter of the brim, measuring 5 in.

Cavity.—A certain plane is usually taken to represent the cavity for the purposes of measurement. This plane cuts the junction of the second and third sacral vertebræ, the middle of the sciatic notch, the upper edge of the obturator foramen ; it ends at the centre of the back of the symphysis pubis. The diameters in this plane are (fig. 92) :

Antero-posterior, 4½ in. This diameter lies between the junction of the second and third sacral vertebræ posteriorly and the middle of the back of the symphysis.

Oblique. This diameter of 5 in. extends from the sciatic notch to the posterior edge of the obturator foramen. The oblique diameter is slightly extensible.

The transverse, 4½ in., lies between points on the ridge which divides the 'inclined planes,' where this ridge is cut by the plane of the cavity.

The outlet, or middle strait, already defined, has the following diameters (fig. 93) :—

Antero-posterior ; from the lower end of the sacrum to the lower edge of the symphysis, 4½ to 5 in.

Oblique ; from the middle of the lesser sciatic ligament to the middle of the obturator membrane of the opposite side, 4½ in. (extensible).

Transverse ; from the tip of one ischial spine to that of the other : this measures 4 in.

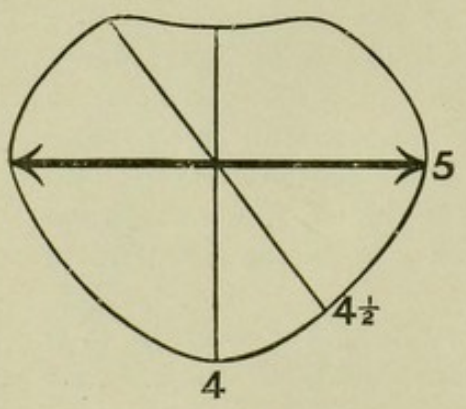

Fig. 91.—Brim.

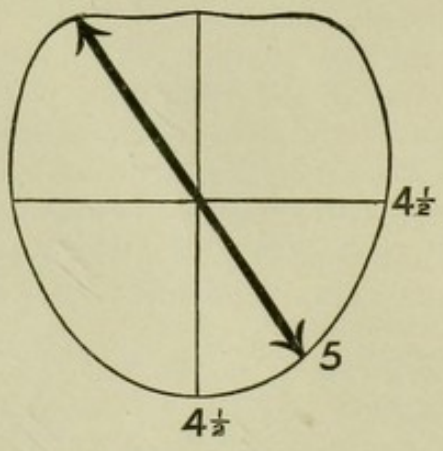

Fig. 92.—Cavity.

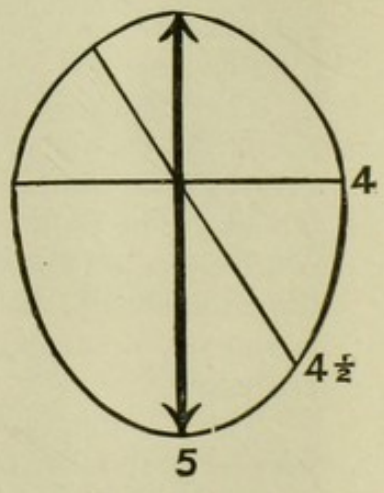

Fig. 93.—Outlet

Tabulating these numbers,

	Ant.-post.	Oblique	Transverse
Brim	4 in.	4½ in.	5 in.
Cavity . . .	4½ „	5 „	4½ „
Outlet . . .	5 „	4½ „	4 „

it will be seen at once that there are three measurements of 5 in., corresponding from above downwards to the transverse, the oblique, and the antero-posterior diameters of their respective planes.

It will be noticed also that the antero-posterior diameters increase from above downwards, while the transverse ones diminish (see figs. 86 and 87), and that, taking the tube as a whole, two screw-like surfaces exist ; so that an ovoid body lying with its longer diameter in the transverse diameter of the brim must, as it descends, rotate either in the direction of the spiral of a corkscrew or in the reverse direction. To illustrate this, let us imagine the head lying with the occiput to the left and forehead to the right. This will

bring a diameter of 4½ in. (occipito-frontal diameter of head) into relation with the Brim. As the head descends, this 4½ in., so as to be in the most favourable position, must come into the oblique diameter in the Cavity. It can do this by turning either occiput or forehead forwards. If the occiput turn forwards, the head turns in the direction of a corkscrew ; if backwards, in the reverse direction. So there may be said to be two screws, one a right-handed one and one a left-handed one, in the same tube, either of which can act, if not impeded, on a head-diameter large enough to come into relation with it. One is made up of the left anterior part of the tube-wall, acting in combination with the right posterior part, the other of the left posterior and right anterior parts. The result of this arrangement is that the longest head-diameter engaged—that is, in relation with the tube-walls—will be found to be in the

Transverse at the brim ;
Oblique in the cavity ;
Antero-posterior at the outlet (in thick lines in figs. 91, 92, 93).

We may now consider the remaining measurements of the pelvis. In giving numbers for these, the average is the only number in each case which is of use, for no two pelves measure exactly alike. Further, the nearest whole number or large fraction to the average is always taken. This is done because, in addition to the variety in the bony measurements, the differing thicknesses of muscle in different women make exact figures useless ; and because it is impossible to make a greater approximation to exactness than within ¼ in. or so when measuring a pelvis during life.

The method of obtaining the measurements which are to be got on the living woman will be best dealt with under Pelvimetry, in the chapters on Deformed Pelves.

Between ischial tuberosities, 4 in. (the same as the transverse diameter of the Outlet).

Depth of walls :

	inches
Posteriorly (sacrum)	4½
Anteriorly (symphysis)	1½
Laterally (pectineal eminence to tuber ischii)	4

External measurements (including tissues covering bones) :

External conjugate, 'diameter of Baudelocque,' from tip of last lumbar spine to middle of front of symphysis	7½ (about)
Between iliac spines	10
Between iliac crests	11
Between posterior superior spines (showing width of sacrum)	5
Width over trochanters	12 (about)

In addition to these measurements there is the Diagonal Conjugate, already mentioned. This measures 4¾ in.

Note.—The value of such seemingly remote measurements as those of the distances between the spines and between the crests, which are of

course measurements of a part of the pelvis not concerned in labour, lies in the fact that an idea, often a very close one, can be obtained from them of the diameters and general shape of the true pelvis.

Pelvic Articulations.—The articulations are of interest, as by their presence they prevent the pelvic tube from being an absolutely rigid one. The flexibility they confer is, however, very slight.

The joint with the greatest mobility is the sacro-coccygeal. It has been already pointed out that, from an obstetrical point of view, the coccyx is only a part of the muscular pelvic floor. It shares in the freedom of movement belonging to this, hinging, of course, on its upper end.

The sacro-iliac articulations allow of very little movement, or at least not much is required of them, owing to the union of the front ends of the innominate bones at the pubes. The only movement of any importance in normal labour is a gliding one, which occurs as the sacrum swings on an axis passing transversely through its upper vertebra, advancing or retreating its lower end. By this movement some further room is obtained in the antero-posterior diameter at the pelvic outlet.

The symphysis pubis in the pregnant woman obtains, in common with the other joints, increased mobility. Its synovial space enlarges, and allows of a small amount of gliding movement. There is practically no separation of surfaces ; in fact, only a very considerable separation could increase the antero-posterior diameters to an appreciable extent (see Symphysiotomy, p. 402).

Soft Parts of the Canal.—The lower and more flexible part of the birth-canal has now to be described. Before doing this it is necessary to mention the soft parts which at some places cover the interior of the pelvis and act as padding. These consist of the following muscles : the psoas and iliacus muscles at the brim ; the obturator internus over the lateral and a little of the anterior walls and small sciatic notch ; the pyriformis, lying over the edge of the sacrum, and filling the great sciatic notch.

These muscles diminish the diameter in which they lie to the extent of their thickness, the psoas and iliacus bringing the transverse measurement at the brim down to about the size of the oblique diameter.

It may also be noted here that the obturator internus lies on the 'anterior inclined plane,' filling up the declivity and making the inclination disappear. Thus one of the 'inclined planes' only exists in the dried pelvis, and has probably no special effect on the movements of the fœtal head under ordinary circumstances.

The anterior pelvic wall is least covered with soft parts of any, and the back of the pubis has no thickness of muscle to act as a pad, and so save from injurious pressure the parts which lie between the bony wall and the bones of the fœtal skull. The importance is that, greatly owing to this arrangement, the base of the bladder is in some cases of obstructed labour so damaged that it sloughs, producing a vesico-vaginal fistula.

The muscles just described do not modify the funnel shape of a coronal section of the pelvis.

Pelvic Floor.—Below the 'white line' corresponding to the outlet, the parturient canal is mainly composed of muscle and fascia. The only bony

structures are the coccyx, which is of no importance as a bone, and the lower margin of the pubic bones; the tubera ischiorum have no relation to the mechanism of normal labour.

The canal here consists of a lateral and a posterior wall only, as the anterior wall ends at the lower margin of the symphysis; and this edge of bone, the angle being rounded off by the subpubic ligament, opposes the whole length of the posterior part of the pelvic floor.

The pelvic floor (posterior segment), when stretched by the fœtus, measures from the tip of the sacrum to the anterior border of the perinæum about five inches. Its upper anterior surface is concave on antero-posterior section, and also on transverse section (figs. 94, 96, 97). It is composed of muscles and fascia mainly.

Muscles.—These consist of the Levator Ani, which corresponds to nearly the whole extent of the floor; and, forming a second muscular layer on its superficial surface, the Sphincter Ani, the Transverse muscles of the Perinæum and the Sphincter Vaginæ.

Fig. 94.—Pelvic floor (distended) from the side. The markings on the inner surface of the pelvic floor do not represent the direction of the muscular fibres (see fig. 97 for this).

Levator ani.—This is a thin muscle whose fibres are in many subjects not sufficient to form a continuous layer of muscle, but in places leave intervals between the bundles. By itself, therefore, this muscle cannot be considered the strongest part of the floor. It is by some anatomists separated from the Coccygeus, a bundle of fibres whose independence is not always well marked. This bundle will be here described with the rest of the muscle.

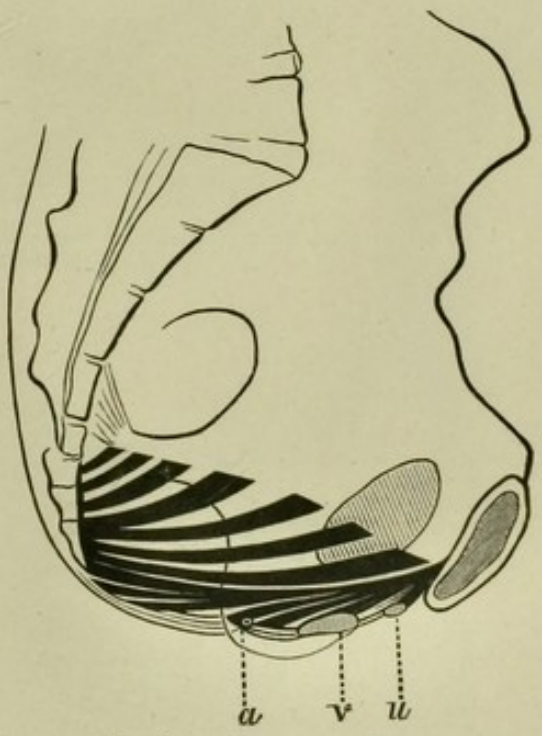

Fig. 95.—Direction of groups of fibres of levator ani. *a*, anus; *v*, vagina; *u*, urethra.

Origin.—From the back of the pubes, then running along the 'white-line'

to the spine of the ischium and on to the lesser sacro-sciatic ligament on each side.

Those fibres arising from the pubes pass backwards to be inserted into the last two pieces of the coccyx, and on their way send fibres to the urethra,

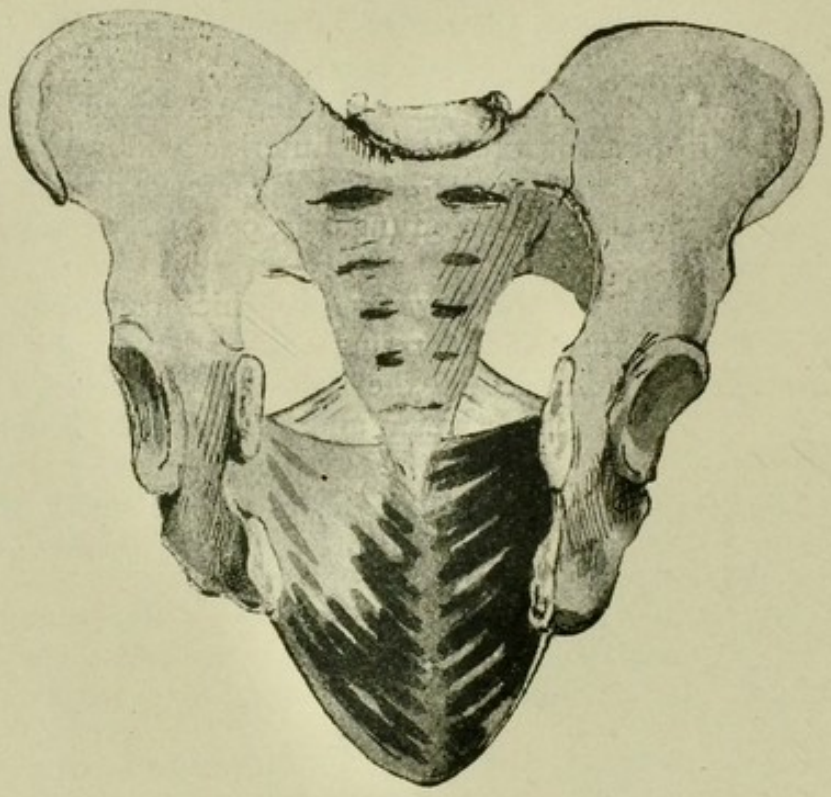

Fig. 96.—Pelvic floor (distended) from the front. The markings do not represent the muscular fibres (see fig. 97).

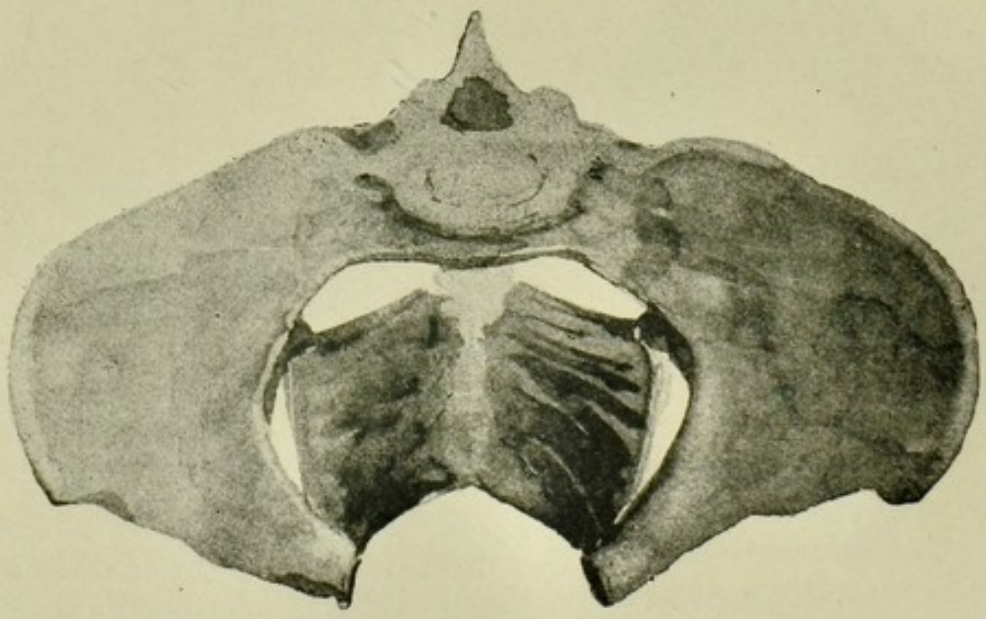

Fig. 97.—Pelvic floor from above (part of pubic bones removed).

vagina, and internal sphincter ani, and a few to unite with those of the opposite side behind the anus (fig. 95). The action of this part of the muscle is to draw the coccyx upwards and forwards, and to form a sphincter for the vagina and to some extent for the anus. It is this part of the muscle which

can sometimes be felt per vaginam to be spasmodically contracted in cases of vaginismus, or more rarely as causing obstruction in labour. This division of the muscle has been called the pubo-coccygeus by Savage. The greater extent of the muscle, that part arising from the 'white line' and the rest of the line of origin, runs from here backwards, downwards and inwards, to the side of the coccyx and of the lower end of the sacrum.

This muscle, corresponding as it does to the form of the pelvic floor, forms a diaphragm with the concavity upwards.

The second layer of muscles is a still thinner one. They all meet at the 'central point' of the perinæum, which is the lowest point in the curve formed by their union, and they raise this point when they contract. Between the two halves of the sphincter vagina the fœtus has to pass, and in this process the muscle is extraordinarily stretched.

Fascia of the Pelvic Floor.—This element of the pelvic floor has been more particularly studied of late, and it is found to be of considerable importance. It forms a very tough and unyielding sheet of tissue, from which all the pelvic viscera receive their support, most of them directly, being woven into the texture of the fascia at their points of support, and some indirectly, by resting on its surface, as the uterus.

It may be described in two portions, a parietal and a visceral one (fig. 98). The less important parietal layer covers the muscles described as padding muscles at the sides ; in front it forms the posterior layer of the triangular ligament, and is perforated by the urethra and vagina ; at the back it helps to cover the sciatic notches.

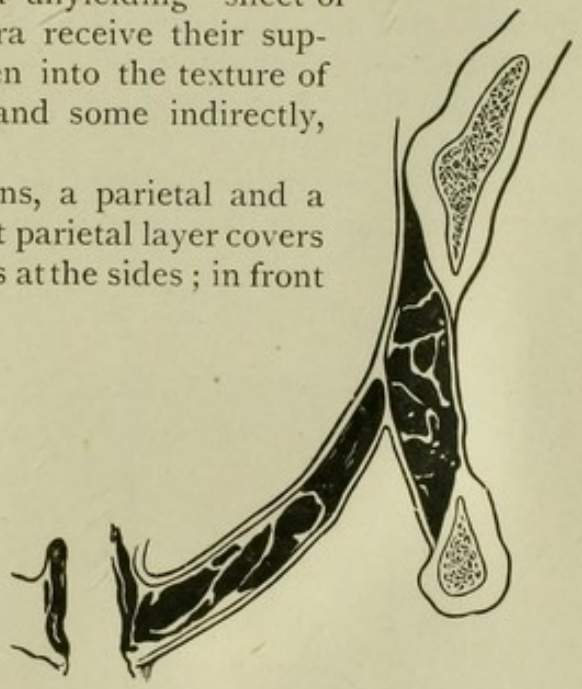

Fig. 98.—Fascia of pelvic floor and its relations to the levator ani and obturator internus and to the bony pelvis.

The visceral layer is continuous with the fascia covering the sides of the pelvis ; and it and the lower part of the parietal layer just described are produced by the splitting of the fascia which descends over the brim. The splitting takes place at the 'white line.' From this line of origin the visceral layer extends downwards and inwards to the middle line, where its fibres fuse with the connective tissue of the base of the bladder, the vagina and the rectum. It thus slings these structures in the pelvis. On its lower surface is the levator ani, which is covered inferiorly by a thin layer of fascia, the anal fascia.

The deep layer of the superficial fascia of this region is very tough and aponeurotic, and gives material aid in strengthening the pelvic floor.

Looking now at the pelvis, including bones and soft parts as one tube, its general construction is readily seen see (figs. 86 and 87).

Above, the tube is a rigid one ; below, it is elastic. The rigid part is straight or nearly so ; the elastic part is strongly curved, and curved in such a way that the change of direction of the fœtal path is managed with the least possible abruptness. This change is from a course in the axis of

its entrance, the pelvic brim, to one in the axis of its exit, the vulvar orifice.

The part of the fœtus which descends first will be the first acted on by the surface on which it impinges ; and as all the surfaces of the pelvic floor converge to the vulva, the part in advance will always be turned forwards if there is nothing to prevent such rotation. The impact of the fœtus on the pelvic floor takes place at the angle which marks the change of direction of the axis of the tube (see fig. 87).

CHAPTER XI

ANATOMY OF FŒTUS

C. **The Body to be expelled.** (**The Fœtus.**)—The anatomy of the placenta and membranes has been already described, and this section will be concerned with the fœtus only.

This body is best considered as being composed of two irregular ovoids, the head and the trunk.

The two ovoids tend before or during normal labour to so place themselves that together they form a single roughly ovoid mass whether viewed

Fig. 99.—Attitude of flexion.

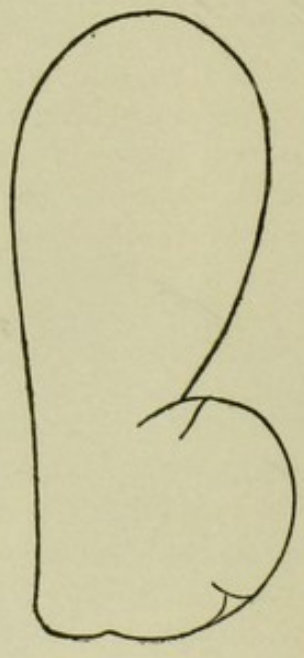

Fig. 100.—Attitude of extension.

from the side or the front. This holds good in the case of flexion or of extension, but the former (figs. 99 and 100) makes the more compact ovoid and is the natural attitude of the fœtus.

So long as the long axes of the two ovoids are as nearly parallel as the neck will allow, and the main axis of the ovoid formed by their combination coincides as nearly as possible with the axis of the parturient canal, the

mechanism is a normal one. This holds good by whichever extremity, head or breech, the fœtus presents (cephalic or podalic lie).

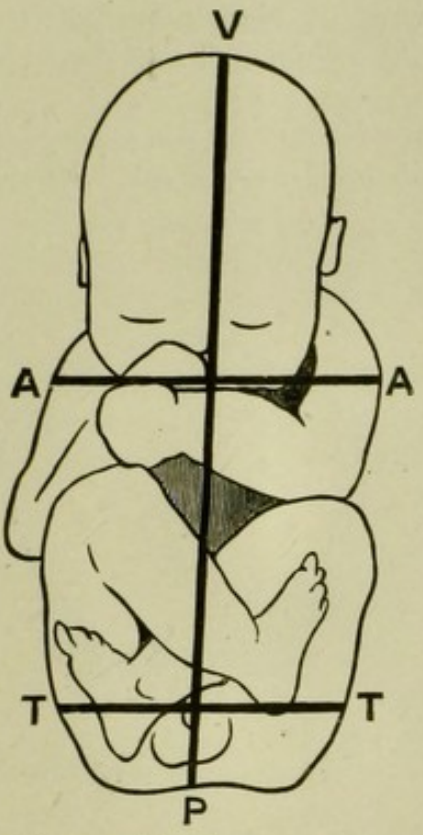

Fig. 101.—Fœtal measurements.

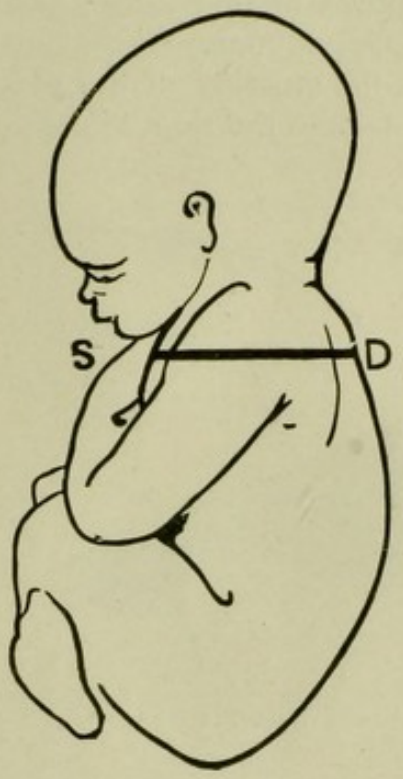

Fig. 102.—Dorso-sternal diameter.

Trunk.—The diameters of the trunk of the fœtus are very compressible, and those which are of importance are few. They are (figs. 101 and 102) :—

	inches
Bis-acromial (*A A*)	$4\frac{3}{4}$
Bi-trochanteric, Bis-iliac (*T T*)	4
Dorso-sternal (*D S*)	$3\frac{1}{2}$
Vertex to breech (vertico-podalic), (*V P*)	$9\frac{1}{2}$ to 10

Head.—The importance of the fœtal head in the mechanism of labour is due to its large size and comparative want of plasticity in proportion to that of the rest of the body. It will, however, be seen to be plastic within a limited range, though some of its diameters, those of the base, are incompressible.

If a section be made parallel with the coronal suture and a little behind it through the parietal eminences and the mastoid processes (fig. 104), the relations of the compressible vault and the incompressible base will be seen. The *base* is formed of solid, firmly anchylosed bones ; the *vault* of thin semi-cartilaginous plates, flexible in themselves and, with the exception of the frontal bone, united to the base and to each other by membrane only.

The base, from an obstetric point of view, consists of a mass of bone including the face and inferior maxilla, and the vault is attached behind and above it. The attachment is made along a line drawn through the junction of the orbital and squamous parts of the frontal bone, continued backward

by the squamous suture and downwards by the hinge-like junction of the tabular part of the occipital bone to the basilar and condylar portion (fig. 103).

Sutures and Fontanelles.—In addition to the sutures of the adult skull, the fœtal head has a frontal suture allowing of movement between the two halves of that bone; and there is also the joint just mentioned across the occipital bone.

At the crossing of the two lines of suture formed by the coronal on the one part and the sagittal continued into the frontal on the other, there is a

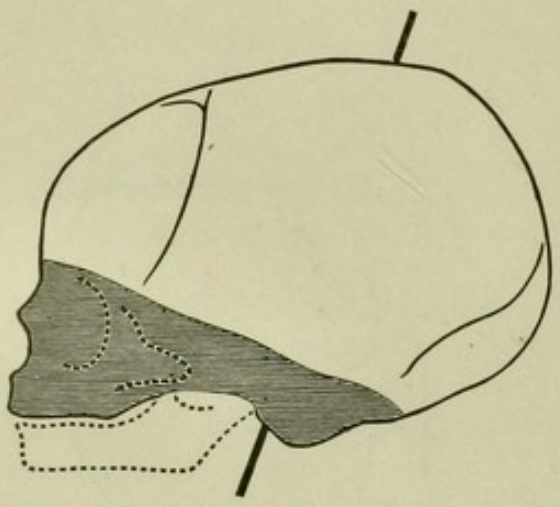

Fig. 103.—Sagittal section through skull showing base and vault. Black line shows line of section in fig. 104.

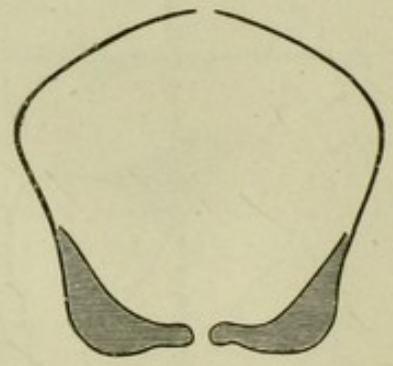

Fig. 104.—Coronal section of skull through parietal tuberosities.

large membranous area, the *Anterior Fontanelle* or *Bregma* (see fig. 107). This fontanelle is rhomboidal in shape and has opening into each of its four angles a suture. The greater part of its area lies between the two halves of the frontal bone, and it reaches anteriorly about half way from the line of the coronal suture to the *glabella*, a space at the root of the nose just above the fronto-nasal suture. Posteriorly, this fontanelle forms a blunt indentation between the parietal bones. It measures roughly $1\frac{1}{2}$ in. in length by $1\frac{3}{4}$ in. across.

The *Posterior Fontanelle* has only three sutures opening into it, and by this means is distinguished on vaginal examination during labour from the anterior. It is formed by the union of the sagittal with the apex of the lamboidal suture, and has no dimensions.

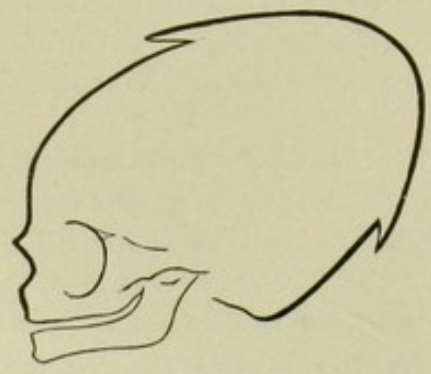

Fig. 105.—Method of overlapping of bones of vault.

Temporal Fontanelles.—The only ones to be felt are the posterior ones (see fig. 106) lying at the junction of the lambdoidal, parieto-mastoid, and occipito-mastoid sutures. These fontanelles are triradiate, and may on this account be mistaken for the posterior fontanelle (see Diagnosis of Positions).

Plasticity of Vault.—At the fontanelles and sutures of the vault considerable overlapping of the bones occurs under pressure; the sutures are not mere lines of membranous union, but are of sufficient width to allow of considerable movement and over-riding of the bones on one another. This overlapping takes place in a definite way

in all cases ; the parietal bones always over-ride the frontal and the occipital bones (fig. 105), and of the two parietals, the one most pressed upon—namely, the one which is posterior in the pelvis—always goes under the anterior. The two halves of the frontal bone obey the same rule as the parietal bones. The bones themselves are capable of very considerable bending owing to their thinness and membranous condition, and their flexibility plays an important part in the adaptation of the head to the pelvic diameters. In addition to the flexibility of the bones and their overlapping at the sutures, the head can be slightly reduced in total volume by (*a*) the flow of cerebro-spinal fluid into the spinal cavity ; (*b*) by the emptying of the cerebral vessels, both of which events occur when the head is compressed in labour.

The brain of an infant will bear much more compression and alteration in shape than that of the adult, at all events as regards the hemispheres ; the ganglia at the base are protected by the solidity of the bones there.

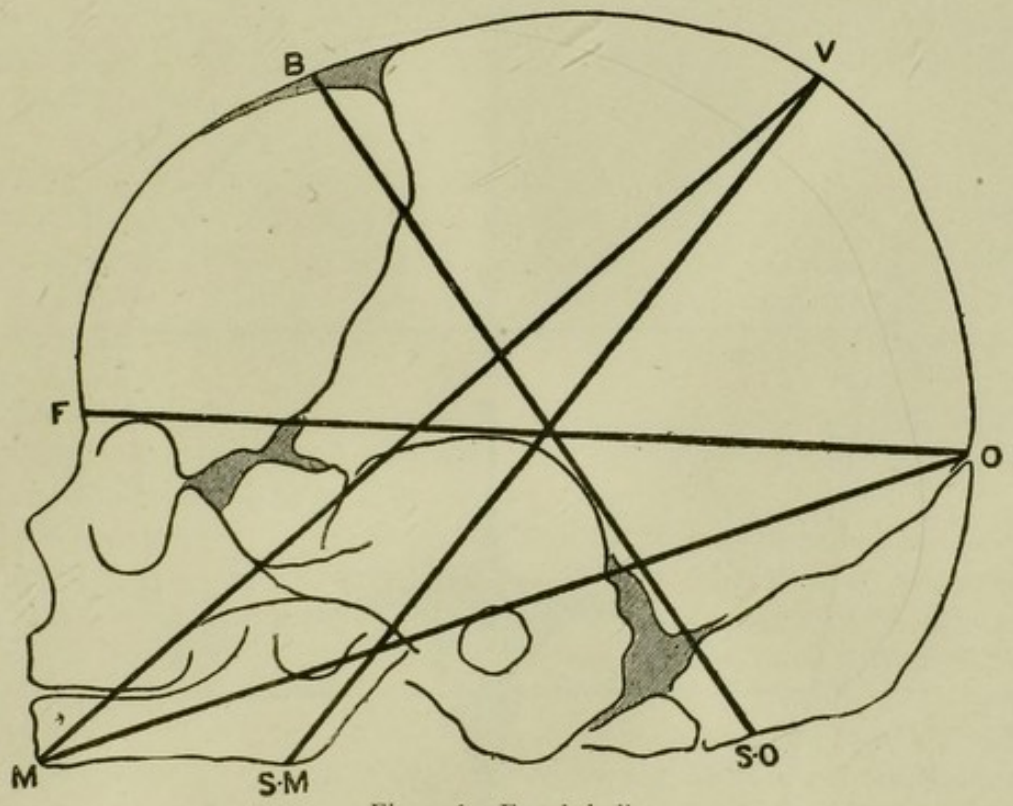

Fig. 106.—Fœtal skull.

Diameters of the Fœtal Skull.—The diameters of importance in labour are taken between certain points which can be made out during life. Those most important in cases of deformities of the pelvis are the diameters of the base, as they are incompressible ; but those which come into relation with the pelvis in ordinary cases of labour are the diameters of which one end at least lies on the vault, and which are therefore reducible.

	inches
Fronto-occipital (*F O*) (fig. 106), between root of nose (glabella) and posterior fontanelle	$4\frac{1}{2}$
Mento-occipital (*M O*), point of chin and posterior fontanelle	5
Suboccipito-bregmatic (*S-O B*), angle at nape of neck and centre of bregma	$3\frac{3}{4}$

	inches
Suboccipito-frontal, nape of neck and anterior angle of bregma	4
Mento-vertical (*M V*), point of chin and highest point on crown, about middle of sagittal suture	$5\frac{1}{2}$
Cervico-bregmatic, angle formed by neck and chin, and centre of bregma	$3\frac{3}{4}$
Cervico-vertical (*S-M V*), angle formed by neck and chin, and vertex	$4\frac{1}{2}$
Bi-parietal (*P P*) (fig. 107), parietal eminences (greatest transverse)	$3\frac{3}{4}$

The following are incompressible :—

Bi-mastoid, mastoid bones	3
Bi-malar (*M M*), malar tuberosities	3
Bi-temporal (*T T*), anterior ends of coronal sutures	3

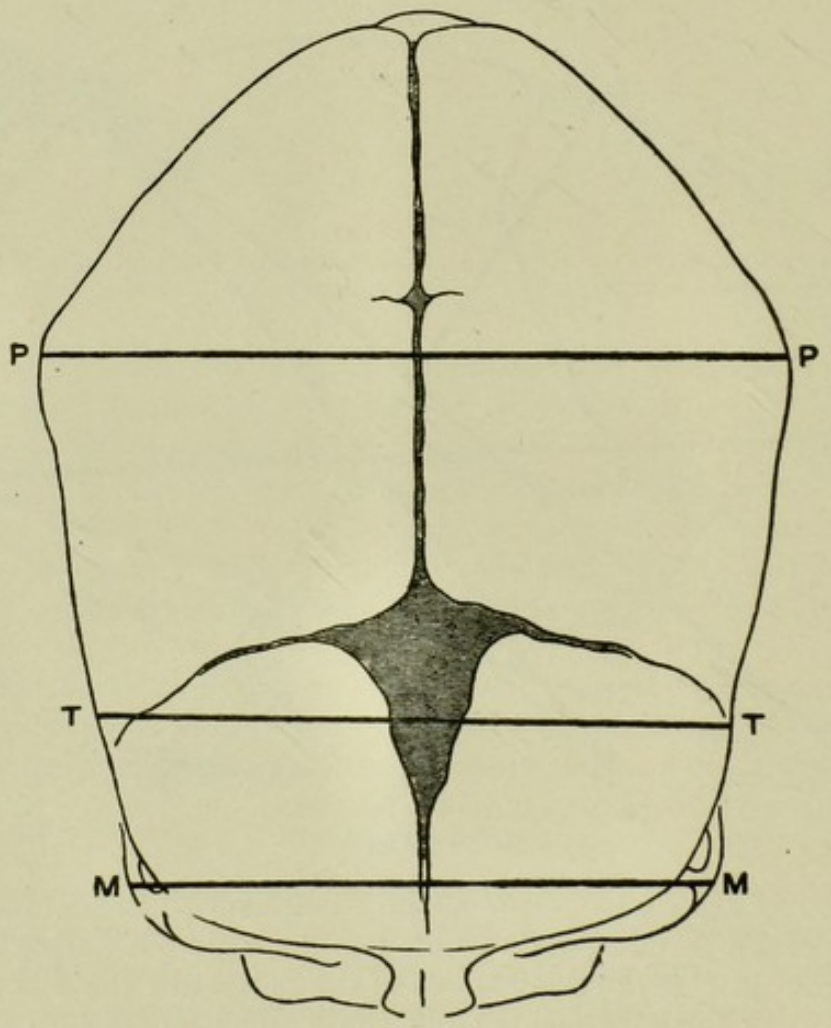

Fig. 107.—Fœtal skull from above.

It will be readily understood that single diameters would be of little use unless they were an indication of the circumference of the plane of the skull in which they are taken. As the head is roughly spheroidal, the diameters give a pretty fair idea of the bulk of the mass to be transmitted. In the case of the diameters lying around the long mento-vertical axis of the head (suboccipito-frontal, suboccipito-bregmatic), they are about one-third of their

corresponding circumferences, as is the case in all figures approaching the circular. Those of importance are :—

	inches
Circumference of the fronto-occipital plane . . .	13½
Circumference of the mento-occipital plane . . .	14
Mento-vertical circumference	15½
Suboccipito-bregmatic	11
Suboccipito-frontal	12
Cervico- or submento-vertical	13

The circumference at the shoulders in the

Bis-acromial plane is	13

No mento-frontal diameter is given, as there is no fixed point on the frontal bone to which a line can be drawn from the chin. Roughly speaking this diameter may be considered as about 3 in., of which the part between the glabella and chin measures about 1½ in. This last is of great importance ; it is the one which is usually brought into relation with the conjugate when a face-presentation is induced after removal of the vault by cranioclasm (p. 390).

If now we consider together all the ways in which the head can adapt itself to the birth-passage we have the following :—

It can bring its smallest available diameters into relation with the largest diameters of the cross-section of the birth-canal in which it happens to lie, by lateral movements on the trunk, antero-posterior movements on the trunk (nutation), rotary movements on the axis of the trunk continued upwards.

It can be compressed in any diameter which includes the vault, by overlapping of bones at the sutures ; flexibility of the bones themselves ; reduction of its total volume.

The former group of methods is by far the more important, since it occurs in all cases ; the alteration in shape and volume is a means called into play only to a limited extent in the ordinary mechanism of labour, and takes place to a marked degree in those cases alone where sufficient adaptation by the various movements above described is prevented by some abnormality of the parturient canal, or some faulty position of the head. It then compensates in a considerable degree for the want of normal movement.

CHAPTER XII

ACTION OF THE EXPELLING FORCE

THE forces which expel the ovum comprise the action of three groups of muscles ;

1. The uterus.
2. The vagina and pelvic muscles.
3. The auxiliary muscles of labour (abdominal muscles).

1. **Uterine Contractions.**—The contractions of the uterus are by far the most important factor in the process of expelling the ovum.

Before describing their mode of action in detail three important characters belonging to them must be mentioned :

They are involuntary, intermittent, painful.

As they are *involuntary* the beginning of labour and that of each contraction during labour are independent of the woman's will. The contractions may be rendered weaker or inhibited entirely for a time by various agents ; for instance, emotion, such as dread of the pain which contractions produce ; or the nervousness which the entrance of a stranger, such as the medical man, causes. They are liable to reflex inhibition, from a loaded rectum or bladder.

The contractions are *peristaltic.* In those animals, rabbits for instance, which have a long tubal uterus, this character can be easily seen, and the organ can be perceived to behave exactly like a length of intestine.

The contractions which take place in the human uterus are in all probability of the same character, although in the short, round uterus of a woman this is impossible to demonstrate clinically.

They are *intermittent.* Each contraction begins gradually and reaches its acme more or less rapidly, according to the stage of labour, disappearing in the same, but in an inverted manner.

In all the stages of labour the uterus may be felt to harden under the hand laid upon the abdomen ; in the earlier ones slowly, in the later ones more rapidly. During the intervals between the contractions the uterus may be felt to be completely relaxed.

The average duration of each pain is about one minute ; but there is some difference in this particular between the beginning and the end of labour, as the pains occupy only a few seconds at first, but come to last longer and to be much stronger as the final stages of expulsion of the fœtus approach.

The pains, as the uterine contractions are called, are rhythmical in their intermission ; that is, there is a certain regularity in their appearance and disappearance. This rhythm varies in rapidity in the same ratio as the duration of separate pains, the greater the rapidity the longer the pain ; in the beginning there are long intervals, say, of a quarter of an hour, towards the end the intervals become very short, and often last only a few seconds.

So that looking at the process of expulsion of the fœtus as a whole, the uterus, just as in the individual pain, begins quietly, and gradually attains its maximum degree of activity ; thus

Fig. 108.—Diagram of pains in the course of labour. To be read from left to right. The contractions indicated by the last two thickenings in the line belong to the third stage.

There are great advantages in the intermission of contraction. As will be seen later, the circulation in the uterine sinuses and the placenta comes to a standstill during a pain, and the fœtus, in common with the other contents of the uterus, is powerfully compressed. This state of things could not be borne for many consecutive minutes, for the fœtus suffers from compression of its nervous centres ; its blood is cut off from the oxygen supply ; and the uterine muscle itself is not nourished and loses its irritability.

The contractions are *painful*. This character is the most striking one and is the origin of the term in familiar use. It is due to (1) forcible stretching of the cervix and its attachments, of the vagina, and of the vulva, consecutively; (2) the contraction of the uterine muscle against resistance—a parallel occurs in the intestine when obstruction is present.

In the early stages the pain owing to dilatation of the cervix is most prominent, as the uterine muscle has not yet to put forth any degree of strength. It is now felt mainly in the sacral region, to which part pain arising in the cervix is nearly always referred.

Later, owing to the resistance of the brim, the attachments of the uterus, as will be described, are put on the stretch and give rise to pain at each effort of expulsion, and the more sensitive vagina and vulva have eventually to be stretched. The pain in primiparæ is especially severe in the last-mentioned part, for the narrowness of the vaginal outlet as compared with that of parous women is so marked that not only stretching to a far greater extent, but tearing of the tissues, invariably occur here. The pain of this process is felt in the part involved.

The pain due to contraction against resistance is to a great extent proportionate to the resistance, though not in all cases. For in primiparæ, where the resistances are great, this condition is, as a rule, balanced by the better quality of the uterine muscle; while in multiparæ, in whom the resistances are comparatively slight, the uterus, slackened by many previous pregnancies and labours, is not often in such good working order, and in consequence finds any resistance more difficult to overcome. In a woman's second or third labour the uterus is in a better relation to the resistances it has to encounter than at any other labour, as the passages have been dilated before, and the uterus itself is not yet slackened.

Definitions of Terms used in describing Uterine Action.—It will be as well to mention here what is included in the term *contraction*, as we are just coming to the description of a state of the uterine muscle from which it is necessary to carefully distinguish it, namely retraction.

Contraction means a shortening of the muscular fibre, which, when relaxation follows, returns to its original condition and shape.

Relaxation means that the fibre has ceased to contract. This, as we shall see immediately, does not necessarily involve a return of the fibre to its original condition, for retraction may be present.

Fig. 109. Relaxed; and contracted or retracted fibre.

Retraction is a process which is probably peculiar to involuntary, and most marked in the case of uterine muscle, and is something superadded to contraction, as *it enables a fibre which has shortened to relax without returning to its original length.* The second fibre in fig. 109 may be relaxed, and be retained in its shortened form by retraction alone.

When we think of the kind of work the uterus has to do, we see how admirable an arrangement is the function of retraction. The uterine cavity

has to progressively diminish in size as the fœtus leaves it, for if after each contraction it returned to its original volume, the elastic resistances of the pelvic floor would restore the fœtus to the same position as the one it occupied before the contraction; or if this did not happen, there would be an empty space left between the hindermost part of the fœtus and the fundus uteri.

Or supposing the uterus followed the fœtus down by remaining continuously contracted, then the uterus itself, the placenta, and the fœtus would suffer in the ways mentioned in discussing the advantages of the intermittency of the contractions. In retraction there is a means whereby these difficulties are obviated, for by it the uterus is enabled to preserve the amount of diminution already obtained, and yet to relax at intervals. Its effect may be compared to that of a catch on a windlass, which prevents the rope from running down again when the man winding up a load ceases from his efforts for a time, and thus while he rests maintains the advance made by the sum of his previous efforts.

There is good ground for believing that retraction goes on independently of *contraction*.

Effect of Retraction on the Uterus.—It will be seen when the process of dilatation of the mouth of the womb is described that the uterus may be considered to be divided into two parts, a contracting part and a dilating part. The part which has to dilate to allow the passage of the fœtus comprises the cervix and the zone above this which is limited superiorly by an imaginary line indicating where the cross-section of the uterus is just large enough to allow the fœtus to pass. This line is found to correspond pretty exactly to the line of firm attachment of the peritoneum. Above this line the uterus contracts and retracts, and below it during labour there is only dilation. As the uterine wall retracts it thickens, and consequently the more retraction there is the more marked will be the difference between the thickening upper segment and the dilating and therefore thinning lower segment of the uterine body. Thus is formed a well-marked ring, which has received many names—contraction ring, retraction ring, ring of Bandl. (Fig. 110.)

When labour has been unduly prolonged it is possible to feel, at a varying height above the pubes, what appears through the abdominal wall to be a ridge immediately above a depression, running across the uterus in a more or less horizontal direction. This, which Bandl described, he believed to be the internal os, drawn up above the brim by the retraction of the whole body of the uterus.

It is possible that his belief is justified in some cases, as will be explained under the heading of Rupture of the Uterus, but it is held by most authorities that the ridge lies altogether in the body, and that between the ring and the internal os there is a zone—the lower uterine segment—which is the stretched and thinned dilating part of the body as above described. It must be added that some observers are of opinion that the ridge and depression may be at times due to some accidental condition, such as an arm of the fœtus lying across its body.

To summarise, retraction occurs during labour in the contracting part of the uterus, which is believed by most to consist of the upper segment only. The retracted part is much thicker than the same part before retraction,

and is bounded inferiorly by the retraction ring. The retracted part corresponds to the area of firm attachment of peritoneum to the muscle of the uterus, the lower segment having its peritoneal coat only loosely attached. The amount of retraction during labour in normal cases corresponds as a rule to the duration of labour, the expulsive results of contraction being preserved in this way.

The retraction which occurs during the puerperal period will be described later.

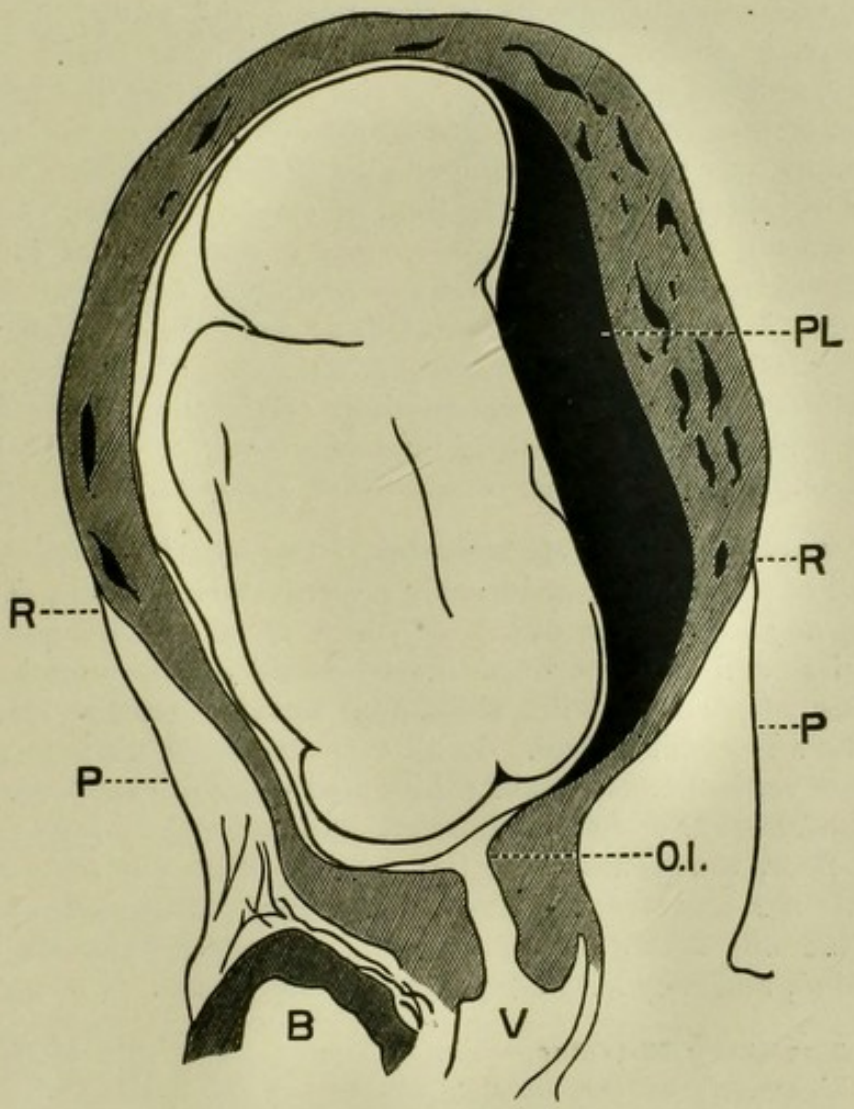

Fig. 110.—Upper and lower uterine segments after a few hours' labour after evacuation of liquor amnii. Frozen section from case in fig. 54. *PL*, placenta; *R*, retraction-ring; *P*, peritoneum; *O I*, os internum; *V*, vagina; *B*, bladder.

Polarity.—This is a useful term, and it is used in analogy with electrical polarity to express the fact that the expelling part of the uterus—namely, the body, or what may be more accurately described in labour as the upper segment—and the sphincter part, the cervix and lower segment, are constantly in a state of opposite function to one another. While the uterus contains the ovum, the muscle of the body is for our present purpose in a condition of rest, but the cervix, more especially the internal os, is in a state of tonic contraction. During labour this relation is inverted, and the body contracts while the muscle of the cervix is relaxed. This antagonism holds good at all times, and it is found that on the artificial induction of dilation at one

'pole,' the other 'pole' is found to contract, and the converse. Examples of this are found in the contractions which take place in the body on mechanical stretching of the cervix, and the dilatation of the cervix which occurs when the body is stimulated to contract by the irritation of a bougie, when such an instrument is passed into its cavity, as in one method of artificially inducing labour.

Elasticity.—This property, meaning the power of any body to shrink into its original dimensions after a force expanding or diminishing these is withdrawn, undoubtedly belongs to the uterus, and probably, as Matthews Duncan says, is chiefly possessed by the peritoneal coat. This has no contractility, and yet it shrinks from its size as it covers the uterus at term down to the comparatively small area of the outer wall of the empty organ, the peritoneum over the upper segment usually being without a wrinkle. The presence of wrinkles shows that the limit of elastic shrinking is over-passed, and they are not rare ; and in some cases it appears that the deficiency of elastic shrinking may lead to cracks or peritoneal ruptures.[1]

The uterus, in expelling the ovum, falls at one time or another into each of the states of contraction, relaxation, retraction ; and these are states entirely distinct in nature from one another. Retraction exists during both contraction and relaxation, probably independently of either. Elasticity is assisting throughout the process of expulsion, and polarity is always present.

2. **The Vagina and Pelvic Muscles.**—The muscle of the *vaginal wall* is at the end of pregnancy considerably hypertrophied, and is of great help in expelling any part of the ovum on which it can act by peristaltic contraction. Its action is perhaps most conspicuously useful in breech presentations, where it and the abdominal muscles are the sole agents in expelling the aftercoming head. In all cases the placenta is to some extent dependent on vaginal contractions for its final stage of expulsion.

The Muscles of the Pelvis.—Those muscles entering into the formation of the pelvic floor, the levator ani, the sphincters of the anus and of the vagina, and the transversi, are the only ones concerned in expulsion. Their contraction, taking them as acting together, is of an incomplete peristaltic kind, and they act as assistants to the vagina.

3. **The Auxiliary Muscles.**—These comprise two sets of muscles : (*a*) the *round ligaments* of the uterus, which consist mainly of involuntary muscular fibre, and the fibres contained in the *broad ligaments* ; and (*b*) the *muscles enclosing the abdominal cavity* above, in front, and at the sides.

Those in group (*a*) concur in the uterine rhythm throughout labour, and act mainly in keeping the uterus from being torn away from its attachments during the pains of the second stage, the round ligaments forming a couple of 'stays.' When these two muscular cords contract, they tend to draw the upper part of the uterus downwards and slightly forwards, and as their upper ends are expanded over the surface of the uterus they help to raise the intra-uterine pressure also.

(*b*) The diaphragm (*D*) (fig. 111) and the muscles of the abdominal wall

[1] The above statements concerning elasticity are quoted almost verbatim from Matthews Duncan. *Obst. Trans.* vol. xxviii. p. 116.

(*A W*) by contracting increase the abdominal pressure, and are thus a very important aid to the uterus (*U*). Taken altogether, they form a second layer of muscular tissue external to that of the uterine wall. They act as follows :—A deep inspiration is taken and the diaphragm thus flattened ; the glottis is closed, fixing the diaphragm, and then the abdominal muscles contract. As the diaphragm descends the fundus is pushed forwards, so that the axis of the uterus comes to lie practically in that of the pelvic inlet.

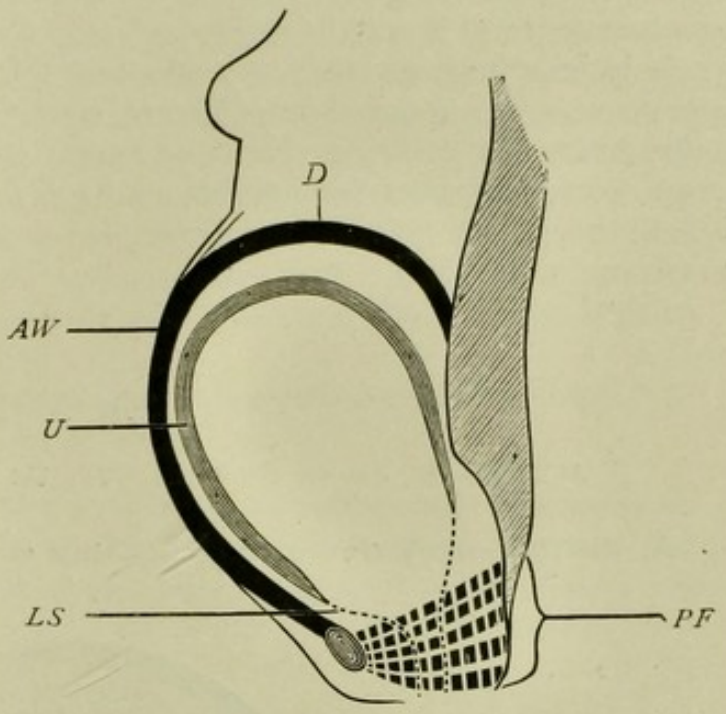

FIG. 111.—Expelling forces and resistances. The forces are in continuous, the resistances in dotted lines. Note that during the first stage of labour the resistances consist of involuntary muscle (the lower segment), but that when the head reaches the pelvic floor in the second stage the resistances consist of voluntary muscle in great part. *D*, diaphragm ; *A W*, abdominal wall ; *U*, uterus ; *L S*, lower segment ; *P F*, pelvic floor.

Their action begins with the second stage of labour ; it is at first almost entirely voluntary, but in the later pains of the second stage it is of a reflex kind, though contractions may be produced by an exercise of the will at any time. When the pains, as they do in the later expulsive stages, last for several seconds, the woman has to open her glottis to take breath, and the abdominal pressure is at once taken off, to be renewed without delay when the want of air has been satisfied. There are, in consequence, often several abdominal contractions during one uterine pain. The glottis is opened, too, when the suffering from forcible stretching of the perinæum causes the woman to cry out ; so that the reflex contraction of the abdominal muscles brought about by the presence of a body to be expelled from the genital canal is inhibited when the reflex movements caused by want of oxygen or by unbearable pain assert themselves.

The effect of the raised abdominal pressure on the uterus is exerted in a downward direction—in the axis of the brim in fact—and tends to propel the whole uterine mass in that axis downward. The action of the round ligaments in keeping the body of the uterus from being detached from its moorings to the pelvic brim is thus reinforced. The second stage of labour can, however, be accomplished without any help from the abdominal muscles, as has already been mentioned ; and it is in the expulsion of the placenta that they are of the greater importance, for when the placenta has left the uterus it is entirely dependent on them and the contractions of the vagina for its complete expulsion from the body. In breech cases where the after-coming head receives no assistance from the already completely retracted upper uterine segment, the abdominal contractions are invaluable in completing the delivery of the child.

They also help to raise the general intra-uterine pressure [1] as long as there is sufficient liquor amnii retained to allow of this; and after the fluid has nearly all drained away, and the direct onward pressure [1] is the only force acting, the abdominal pressure will act mainly in the axis of the birth-canal at whatever level it may be needed.

It is important to study the effect of the uterine contractions on the uterine contents under three different conditions. These are: (*a*) on the entire ovum, the os being closed or nearly closed; (*b*) on that part of the ovum, remaining after the membranes have ruptured, and the liquor amnii below the lowest point of the fœtus has escaped; and (*c*) direct uterine pressure on the fœtus.

CHAPTER XIII

ACTION OF PAINS ON THE UTERUS AND ITS CONTENTS

A. **On the entire Ovum, the Os being closed or nearly closed.**—The effect is to increase the *general intra-uterine pressure.* The result of this, as

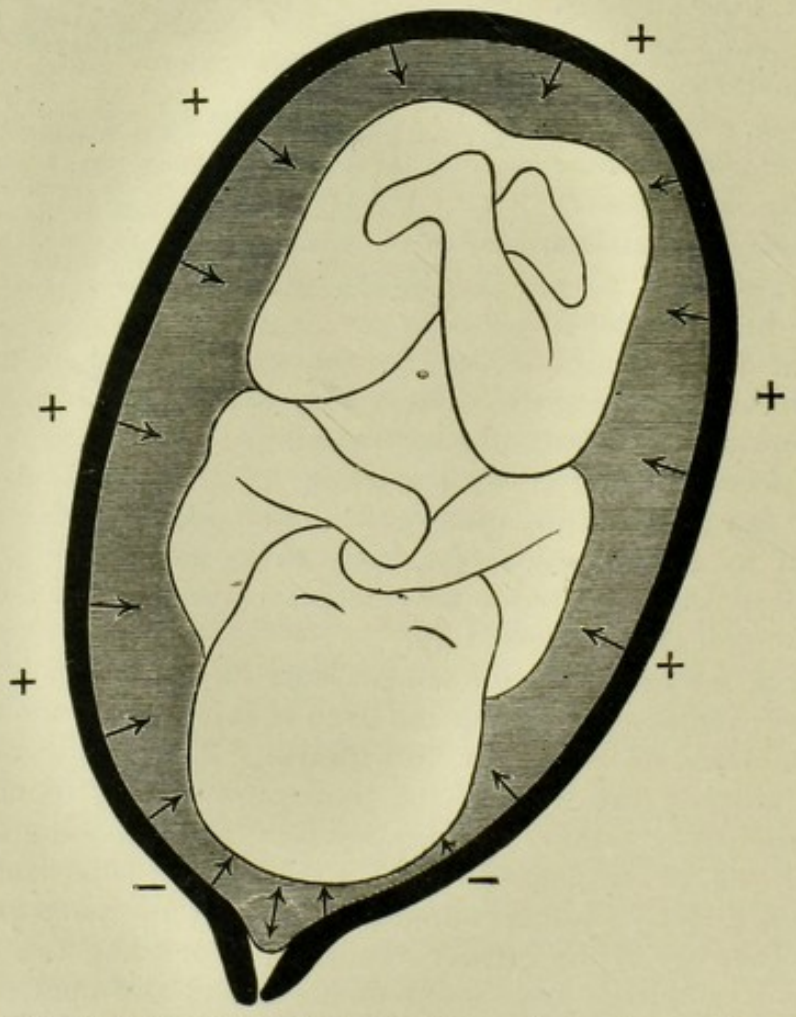

Fig. 112.—General intra uterine pressure during a pain—membranes intact. The + and − signs show the contracting and expanding parts respectively. The arrows show the direction of the effective pressure.

[1] See next chapter.

regards (1) the fœtus, is simply to increase the surface pressure on all parts of its area equally, but not to cause it to advance towards the internal os.

Supposing the internal os firmly closed, there would be no onward movement of (2) the fluid in the amniotic sac. If, however, there is any yielding at the internal os, as normally happens at this time, the fluid will advance in that direction, carrying before it the rather loosely attached membranes which thus come to bulge at the internal os, and forming the 'fore-waters.' Even under these circumstances the fœtus is not pushed in the same direction, for, as will be readily seen, the reacting pressure at the advancing part of the membranes is just the same as that exercised on an equal area of the surface of the fluid by the contracting uterine wall. The lowest point of the fœtus is therefore pressed upwards with the same force as the highest point is pressed downwards. (Fig. 112.)

Previous to rupture of the membranes this relation of the uterine contraction to uterine contents continues to hold good.

B. **On that Part of the Ovum remaining after the Membranes have ruptured, and the Liquor Amnii below the Lowest Point of the Fœtus has escaped.**—The head, if this is the presenting part of the fœtus, now takes the place of the membranes which enclosed the 'fore-waters,' and fills up the internal os. The remaining liquor amnii is retained above the head, and transmits effective intra-uterine pressure to the base of the skull, or rather on to an area of it corresponding to the size of the aperture of the os at this moment. The direction of the force is pretty accurately in the axis of the uterus.

C. **Direct Uterine Pressure on the Fœtus.**—After the liquor amnii retained by the ball-valve action of the fœtal head has drained away so as to allow the uterus to come into contact with the body of the fœtus, the uterine contractions act on the fœtus in a new manner. If we consider the uterus as composed of two sets of fibres, one a longitudinal set and the other a circular set, it will be seen that if these two sets of fibres contract in an equal degree, the uterine cavity, while growing smaller, will still retain the shape it had before diminution. It is found, however, that the circular set contracts much more strongly than the longitudinal, and the uterus, while undergoing diminution in its cross-section, during a pain is actually lengthened. The fœtus is straightened, and therefore lengthened, during the pain too; and its breech is in direct contact with, and being firmly pressed on by, the fundus. This downward pressure of the fundus tends to resist the distorting action of the powerful circular fibres and to restore the uterus to its usual shape, and has received the name of 'form-restitution force.' Its importance in the process of labour lies in the fact that it is a direct onward pressure, forcing the fœtal mass, of which the long axis is made rigid by the circular fibres, down in the axis of whatever part of the birth-canal may be occupied at the moment. (Figs. 113 and 114).

The action of the fundal onward pressure—*form-restitution force*, or *fœtal-axis pressure*, as it is also called—is strongly reinforced by the muscles of the abdominal wall and by the diaphragm, which come into play at this period.

As labour proceeds, retraction of the uterus is steadily going on, and, as already described, causes the contracting part of the walls to lie, on the whole, on a rather higher level as regards the ovum. This thickening of the fundal end (upper segment) and thinning of the lower, in addition to accumulating the uterine energy at the back of the object to be moved onwards, also diminish the circular grip, and therefore the friction of the sides of the uterus on the fœtus. (Fig. 114.)

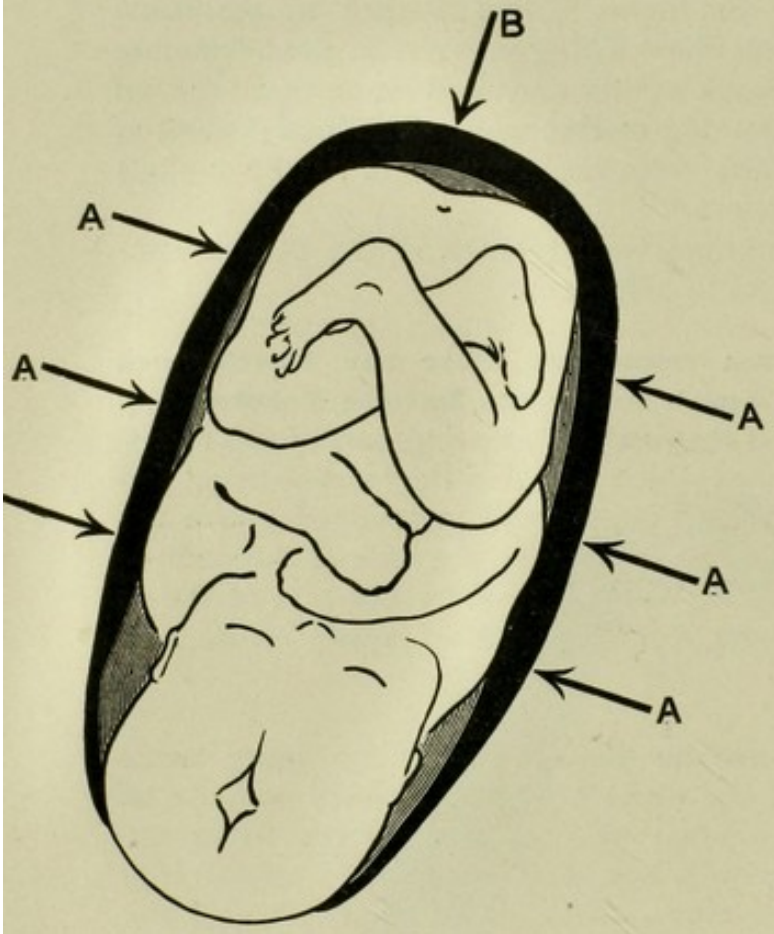

Fig. 113.—*A A*, action of circular fibres of uterus, stiffening and lengthening fœtus; *B*, fœtal-axis pressure.

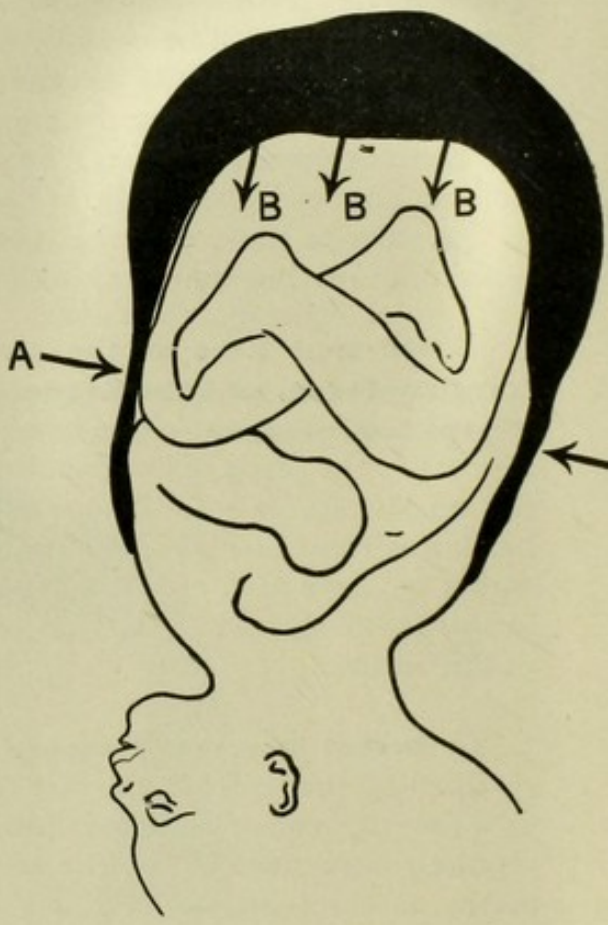

Fig. 114.—*B B B*, direct onward pressure of fundus (fœtal-axis pressure); *A A*, lateral pressure, stiffening the fœtus.

The direction of the expulsive force of the uterus, being that of the uterine axis, is practically that of the pelvic inlet.

Dilation of Cervix.—In the following description of the events which occur in labour, it will be convenient to take as a type the case where the fœtus is in the cephalic lie with the vertex presenting, as the mechanism here is the most frequently occurring one.

The membranes, consisting of amnion (internal) and chorion (external), and containing the amnionic fluid, are the agents which, when dilatation has once begun, complete the process. Their action is at once the simplest and most perfect imaginable. Leaving the fœtus out of the question for a moment, the arrangement is that of a bag filling completely the uterine cavity, and containing fluid of a density little greater than that of water. The pressure in this bag of fluid is raised on contraction of the uterus. Directly the yielding of the internal os begins, to the smallest degree possible, it allows a certain amount of projection of the sac in this direction. (Fig. 112.)

The following points in the anatomy of the lower end of the uterus will be remembered. First, the cervix consists almost entirely of circular fibres, since the longitudinal and oblique fibres which form the main mass of the muscle of the body end abruptly above this in the lower segment (p. 42). Second, the cervix and lower uterine segment have the peritoneum very loosely attached where there is any, and are therefore surrounded by comparatively loose connective tissue.

Given, then, the relative states of body and cervix called polarity, any contraction of the former implies relaxation of the latter. We have during a pain, therefore, the longitudinal and oblique fibres pulling apart the edges of a loosely supported and actively relaxed ring on the one hand, and on the other a raised intra-uterine pressure ready to force some of the uterine contents into the smallest opening.

Under these conditions the internal os begins to dilate.

The sac of the ovum, being not too firmly attached to the uterine wall at the lower pole, tends to bulge through the opening ; and since the pressure in a closed bag of fluid is equal on any two or more equal areas of its surface, there is, in addition to an onward pressure acting towards further projection, a radial stretching action produced on the inner surface of the ring of the internal os, tending to enlarge the diameter of the latter.

The cervix is thus both further invaded by the projecting process of the membranes and at the same time widened.

As the area of the inner surface of the internal os increases, the dilating effect increases in proportion with the additional area pressed upon, so that the wider the os the greater the dilating effect of the intra-uterine pressure during each pain.

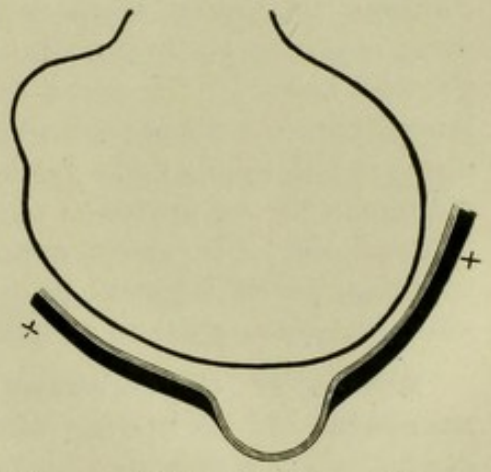

Fig. 115.—Effect of bulging membranes. (Uterine wall black ; membranes a double thin line.)

While the membranes are bulging, the lower pole of the uterus is being withdrawn to a small extent off the lower pole of the ovum, thus aiding in the separation of the membranes. Retraction, as already explained, maintains some of the ground gained at each contraction, so that the bag of membranes (as the projection is called), although it retreats and becomes flaccid in the intervals of the pains, does not after each pain retreat entirely to its position before the pain.

The force of gravity also helps the intra-uterine pressure. In the stage of dilation of the cervix the woman is usually more or less in an upright position, and the pressure of a column of fluid roughly eight or ten inches high is added to the effect of the uterine contraction. It is acting, too, during the intervals of rest between the pains.

The head takes no share in dilating the cervix, and, in fact, during a pain it seems to recede from the opening. This recession is, however, not a real backward movement, but is produced by the projection of the bag of membranes. The head retains its relation to the internal os, and is acted on by an upward pressure of the same force as that exercised on each equal area

in the interior of the uterus as long as the membranes remain entire and there is free communication between the liquor amnii in the bag (fore-waters) and that in the body of the uterus (see fig. 115).

Should the communication be shut off by the head being forced down during a pain so as to exactly plug the lower segment, the bag will be found not to vary in tension during the pains and the intervals respectively. This isolation of the fore-waters is a great disadvantage ; the dilating force is destroyed by removal of the intra-uterine pressure on the circle of cervix surrounding the bag, and at each contraction the pressure forces the head and lower segment together down into the pelvis, and dilatation has to be effected by the head acting as a solid wedge, with the disadvantage of the great friction produced by the blunt shape of the wedge.

In this case a caput succedaneum (see p. 108) may be formed before the membranes rupture, since the intra-uterine pressure is greater than the pressure of the fore-waters on the part of the vertex occupying the opening of the cervix.

In addition to the radial stretching of the lower uterine segment, there is also some longitudinal stretching, and therefore further thinning. The thinning is limited above by the retraction ring, and below by the attachment of the cervix to the vagina, this attachment being fortified in front by the firm union of the supra-vaginal cervix with the base of the bladder, and laterally by the tissues forming the base of the broad ligament and by the utero-sacral ligaments. Posteriorly there is nothing but vaginal wall, and consequently the posterior wall of the lower segment is more stretched and thinned than the anterior and lateral walls. The contrast between the stretched lower segment and the now thickening upper segment becomes more and more marked as labour proceeds.

Effects of Contractions on the Circulation in the Uterus and Placenta.—If the uterine bruit be listened to during a pain, it is found to gradually get higher and higher in pitch, and then to become inaudible for a short space, reappearing and gradually lowering in pitch until it again has the character of the sound when the uterus is at rest.

During this series of events the sinuses are being slowly obliterated and emptied by the muscular contraction, and on relaxation they gradually refill and the circulation is re-established. The nutrition of the uterus is thus temporarily interfered with, as has already been mentioned. The maternal part of the placenta suffers in the same way, but the fœtal part of the organ is not emptied, as the fœtus itself and the cord are under the same pressure as the villi.

Effects of Pains on Fœtal Heart.—The compression causes slowing of the fœtal heart, for it raises the general fœtal blood pressure. This effect is the same practically as the result in the adult of forced expiration with the glottis closed. The slowing may be due, too, to some extent to the pressure on the medullary centres.

Effect of Pains on the Mother generally.—A. *Before the Membranes are ruptured.*—There is no marked disturbance of function at this stage.

The pulse rises ten to twenty per minute gradually during a pain, and

subsides gradually as it passes off. This rise of pulse rate (M) (fig. 116), it will be noticed, contrasts with the fall which happens in the case of the fœtus.

If much pain is felt, as sometimes occurs, the woman may become hysterical now, supposing she is inclined that way, but hysterical attacks during the first stage are rare.

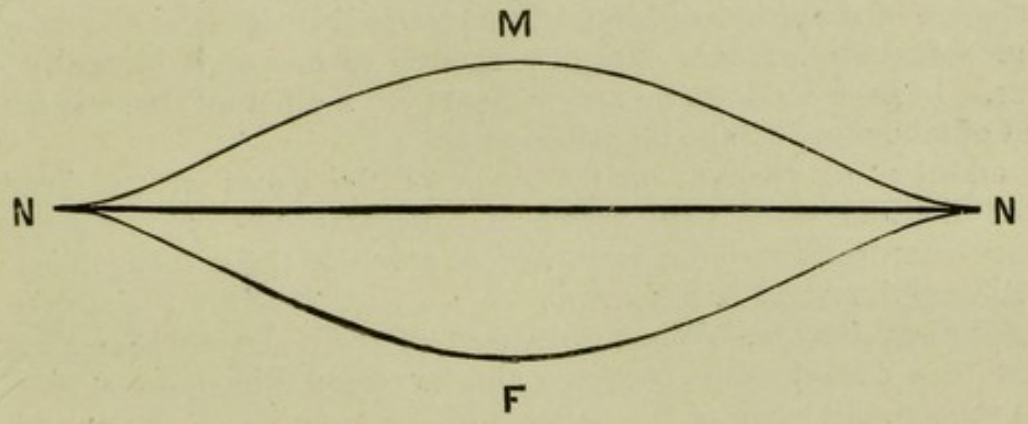

Fig. 116.—Effect of a pain on maternal and fœtal pulses respectively. *M*, maternal pulse; *F*, fœtal pulse; *N*, normal line of both.

Vomiting is an occasional event at this stage, and rigors sometimes occur, as they are liable to do in many instances when sphincters are dilating.

B. *After rupture of the membranes.*—Towards the end of the first stage the pains have caused rather more excitement than at the beginning, but now their effect is a marked one. This will be fully described in the chapter on the Progress of Labour. The pulse rises in a greater degree in this stage owing to the increased muscular exertion involved by the action of the voluntary muscles. At the acme of a pain, when violent expiratory efforts are being made with a closed glottis, the pulse may cease for the space of a beat or two. The temperature sometimes rises, but only a degree at the most.

When the head approaches the vulva the excitement becomes the greater as the suffering becomes more severe, and it reaches a climax as the head stretches or tears the sensitive perinæum. There may be now complete loss of self-control, and the woman in her frenzy may do violence to the child. Such acts, if fatal in their results, are considered with leniency in courts of justice (see chapter on Puerperal Insanity, p. 556).

The skin acts very freely during and after labour, as it does after any other considerable exertion.

Local Effects of the Pressures on the Fœtus.—The pressure on the fœtal surface during expulsion has been seen to be considerable. Before the membranes rupture this is equal on all areas; after rupture, certain parts are pressed upon more than others, the effect of the pressure and its situation depending on the *amount of resistance* offered to the advancing child; the *length of time* during which the pressure is exercised; and the *relative positions* of the fœtal and maternal parts.

The pressure-effects after rupture are mainly visible on the head; for although the body of the fœtus is much more compressible than the head, it at once resumes its shape on removal of the distorting force. The

diameters of the soft body, too, are all, except the bis-acromial, so small as not to fit the pelvic diameters tightly.

The pressure-effects on the body are therefore only momentary, and of no importance.

With the head it is different. It fits the pelvis tightly, and will undergo some change of shape in its passage through this if labour is at all prolonged ; but the soft parts squeeze it tightly enough to distort it in nearly every instance. In each separate lie and presentation a different shape is found at the end of labour, as will be described later.

In addition to changes in the shape of the bones of the head, the different distribution of local pressures brings about local inequalities in the vascular tension, and the most marked result of these inequalities is the production of the *caput succedaneum.*

Caput Succedaneum.—When every part of the body but a small area is exposed to a considerable pressure, the increased blood pressure will be able to squeeze out some of the contents of the vessels into the unsupported tissues, and to prevent the reabsorption of the fluid extravasated. According to the disproportion of the tension inside and outside the vessels of such an unsupported area, the extravasation may consist of serum only, or of blood ; and the longer the time this disproportion lasts the more marked will be the results.

The unsupported part in the present case is the area of surface occupying the ring of birth canal most recently opened up at any moment, whether it be cervix, vagina, or vulva. In normal labour this ring is always bounded by soft parts.

For instance, after the membranes have ruptured at an os dilated to a diameter of three inches, the unsupported area of the fœtus during each uterine contraction (the time in which the disproportion in pressure exists) will measure three inches in diameter. The tissues underlying this area will become œdematous to a degree varying with the amount of pressure and the length of time during which it lasts. The depth to which the tissues are affected depends on the thickness of tissue superficial to the bone underlying.

The term 'caput succedaneum' is sometimes applied also to the swellings which are produced in the same manner on other parts of the body, such as the breech. In the latter case, the scrotum, if the child be a male, and to a lesser degree the external genital organs in the case of a female, become very considerably swollen.

In face presentations, the lip or eyelid is often markedly affected. The instances in which actual extravasation of blood occurs under the skin, the occipito-frontalis tendon, or under the periosteum, or even within the cranial cavity, and the after-history of these swellings, will be considered under Diseases of the New-born Child. (Cephalhæmatoma, p. 581).

The caput is liable to be formed at several periods during labour ; and as would be expected, its situation depends on the presentation existing at the moment at which this tumour is being formed.

Hæmorrhages into other parts of the body of the Fœtus.—It has lately been shown by Spencer [1] that hæmorrhages into internal organs are very

[1] *Obst. Trans.* vol. xxxii.

common in dead-born children, including those cases in which labour is normal. It is very likely that hæmorrhages are much more frequent than is usually supposed in children which survive; and these extravasations may have an important relation to certain diseases which arise in infancy. (See Diseases of the New-born Child.)

CHAPTER XIV

PROGRESS OF LABOUR

It is convenient to divide the processes of labour into several 'stages' for purposes of reference.

These divisions naturally fall into the following :—

Premonitory Stage.
Labour proper :—*First Stage, Dilatation of the Cervix.*
Second Stage, Expulsion of the Fœtus.
Third Stage, Separation and Expulsion of Placenta and Membranes.

To explain this briefly: there are first certain preparatory events which occupy any time from a few minutes to several days.

The first stage begins the process in earnest, and ends on complete dilation of the cervix. Usually rupture of the membranes happens when this is complete. The second stage is now able to begin, and during this stage the fœtus passes through the parturient canal. Directly the child is born the third stage begins, and this in its turn ends with complete expulsion of the after-birth and efficient retraction of the uterus.

Premonitory Stage.—The events which occur before labour really sets in are variable as regards their duration. They also vary in their character, mainly according to the parity of the woman.

It may be mentioned here that a woman pregnant for the first time is called a *primigravida*; one in labour or in the puerperium for the first time, a *primipara*; if she has had children or miscarriages, one or more, previously, she is a *multipara*. When the exact number of the labour is to be indicated she is spoken of as a 1-para (primipara), 2-para, 3-para, 4-para, and so on.

The change of position of the uterus which takes place (p. 40) during the last weeks of pregnancy is by some considered a premonitory sign; but it is rather a remote one in point of time, and as often as not it is unnoticed by the mother.

Patients are frequently warned that labour is imminent by pains of a more or less regular character, usually felt in the abdomen. Attacks of these pains may occur several days before the actual onset of dilation of the cervix. They are often due to disorders of the stomach and bowels, and especially often to constipation. They are sometimes severe and cause much suffering to nervous and sensitive women. They are always very irregular in rhythm.

More regular and less painful are contractions which recur at, as a rule, very long intervals for a day or two before labour, which are simply intensifications of the normal contractions of pregnancy.

Effects on the Cervix.—Pains of the latter class are sometimes accompanied in 1-paræ by some yielding of the internal os, but this is exceptional ; and, as a rule, any real shortening of the cervix (see p. 111) is a sign that labour has begun. In connection with them, however, there is often an increase in cervical secretion, and on examination the vagina is found to be well lubricated with mucus from this source.

In the case of the former kind of pains there is not any such increase in secretion. Probably they do not raise the intra-uterine pressure, and thus do not stimulate the cervix to secrete. This is owing to their being contractions of parts only of the uterine wall and not of the entire organ—colicky contractions in fact.

In either case the uterus may sometimes be felt to harden under the hand laid on the abdomen ; and the pain is referred to the abdomen as a rule entirely, and not to the sacral region. Pains felt in the sacral or lower lumbar area are always suggestive of changes of some kind going on in the cervix.

Frequency of micturition and, less often, of defæcation are found during the last few days before labour. They may be due to the change in position of the uterus, but are much more probably caused by the increase of nervous excitability present in the pelvic organs just now.

This premonitory stage is sometimes absent in multiparæ, and the first stage then begins without any warning.

First Stage

The uterine contractions during this stage are occupied solely in dilating the cervix, and little or no propulsion of the ovum takes place. (The slight advance of the bag of membranes through the internal os in the act of dilating it is the whole amount of forward movement.)

The characteristic events at the beginning of this stage are :—

The *pains* are fairly regular, though possibly separated by long intervals. The intervals shorten steadily as labour advances. The pains are nearly always referred to the sacral region.

The *vagina* is found to be freely lubricated with mucus. This mucus is, as a rule, blood-stained, and is colloquially termed 'the show.' The blood comes from the separated surfaces of the membranes and uterine wall just above the internal os.

The *vaginal portion of the cervix* is undergoing real *shortening* as the canal is progressively invaded by the membranes.

These three events are diagnostic of the beginning of labour. Seeing that all or nearly all of them may accompany the regular contractions observed in the premonitory stage, it may not be easy to fix the exact moment at which labour begins, but these signs are sufficiently characteristic for all practical purposes.

Clinical Events.—The duration of a pain at the beginning of labour varies from two or three seconds to eight or ten, and the intervals occupy

half an hour or more. As labour advances the duration of the pains becomes steadily longer, and the intervals shorter. (Fig. 108.)

There is, as a rule, though not always, a 'show,' and this proves that the cervix is yielding satisfactorily, as it indicates a fair amount of softening and secretion, as well as some separation of the membranes round the internal os and therefore dilation.

The 'show' is not always present in favourable labours; but it is nearly always absent in abnormal conditions of the cervix, such as spasm, or rigidity from fibroid degeneration or new growth, or in the case of irregular and useless pains like those which occur sometimes in the premonitory stage.

In the intervals of the pains the woman is calm and is able to walk about and take food for usual. The pains themselves are not as a rule distressing, for the cervix is a comparatively insensitive structure. The abdominal muscles and diaphragm are not yet called into action, and there is in consequence no need to hold the breath and strain. The pulsa and respiration are not considerably affected just now, but in the later pains of this stage they do become quicker, and their general character comes to resemble that of second-stage pains, to be shortly described.

On abdominal examination the uterus is felt to distinctly harden during a pain, and in doing so to come forward in the abdomen. This projec-

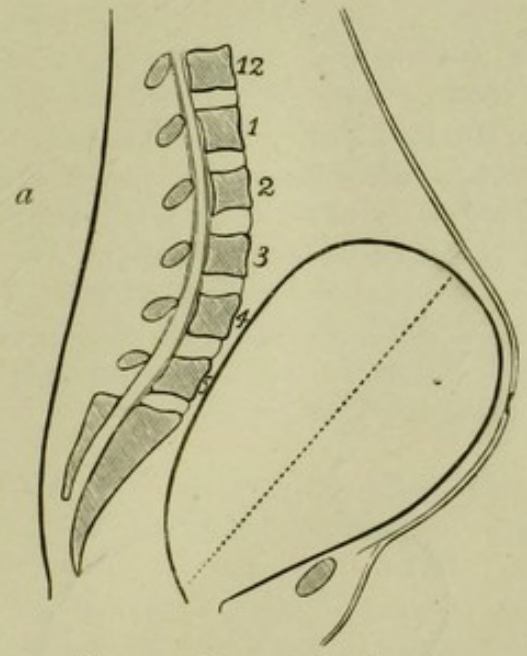

Fig. 117.—Uterus relaxed.

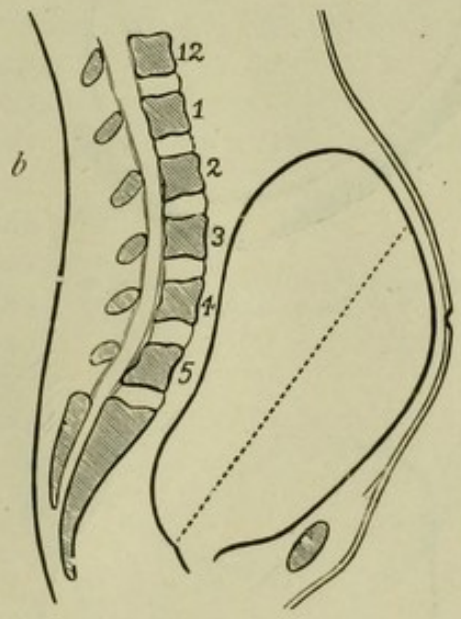

Fig. 118.- Uterus contracting.

tion of the uterus is due to its assumption of a more circular shape on cross-section, by which change in shape from that of the flaccid condition it is caused to move forwards by the resistance of the vertebral column lying behind it (fig. 117 and 118).

Vaginal Examination.—If the membranes have not reached the external os, the cervix during a pain is found to be notably diminished in length, and the remaining undilated part feels like a soft appendage to the spherical surface of the distended lower pole of the uterus (fig. 120).

If they have reached the external os, and this is yielding, the smooth membranes, chorion and amnion welded into one, will be found to stretch

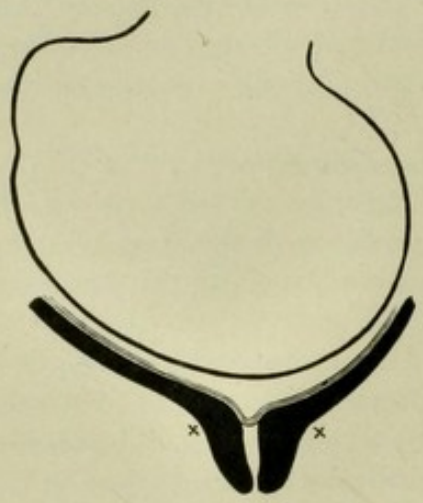

Fig. 119.—Primipara.
× = internal os.

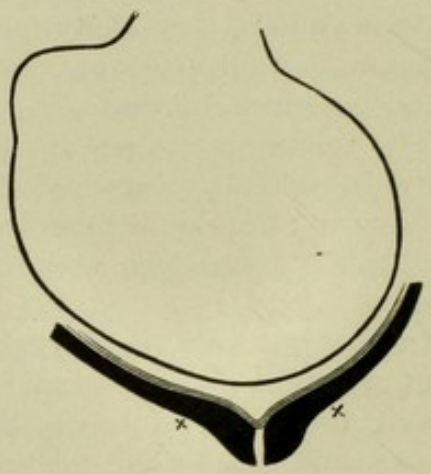

Fig. 120.—Primipara.
× = internal os.

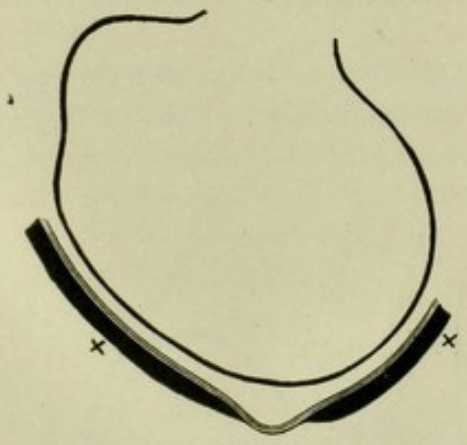

Fig. 121.—Primipara. ×, level of internal os.

during a pain across the aperture; having while the dilation is slight a small curvature, but later on becoming a segment of a larger sphere (fig. 121).

In primiparæ the circle of the os consists at first of a thin and sharpish edge, which becomes thicker and œdematous as labour proceeds. In multiparæ, in whom as a rule the cervix has been lacerated and has thus become irregularly thick at its lower end, this sharpness is not to be felt. In them, too, the external os is usually patulous to start with, and therefore does not elongate and thin to any marked extent as the bag of membranes descends (figs. 122 and 123).

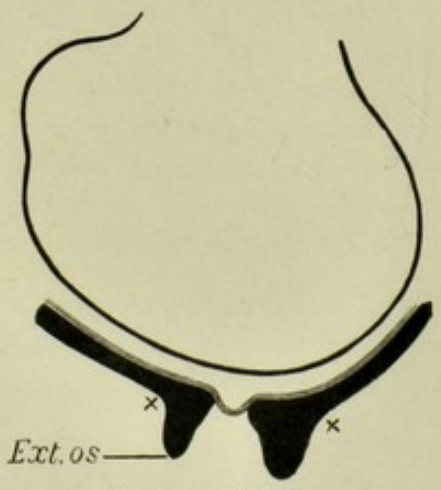

Fig. 122.—Multipara.

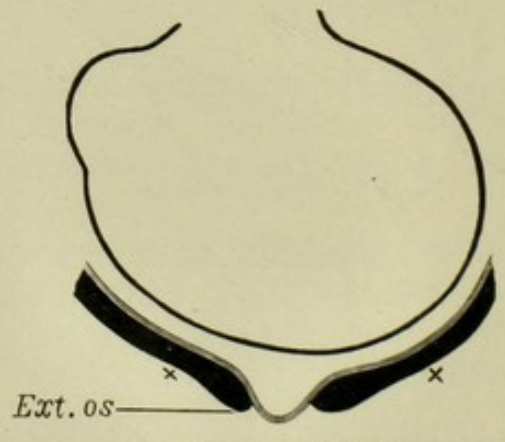

Fig. 123.—Multipara.
× = internal os.

The bag of membranes when tense prevents the head or other presenting part from being felt; but in the intervals it is completely relaxed and is

more or less closely applied to the head, and if a suture lies over the uterine orifice it may now be felt. The anatomy of the head can also be recognised

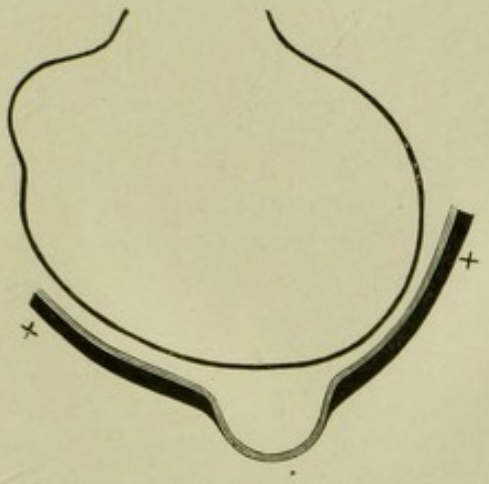

Fig. 124.—In multipara or primipara. × = internal os.

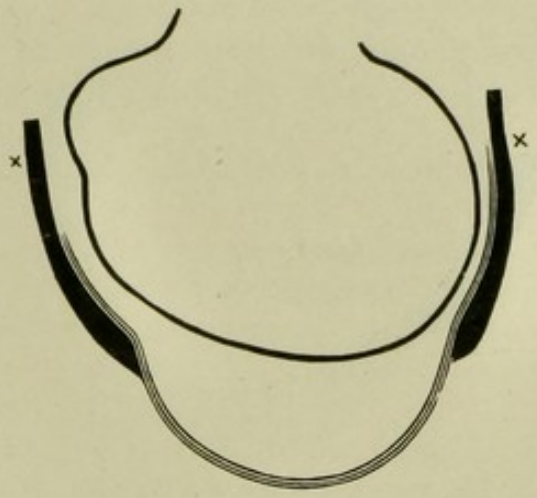

Fig. 125.—In multipara or primipara. × = internal os.

through the anterior uterine wall, and the sutures often made out, if the vagina is sufficiently relaxed to allow the finger to explore freely the lower end of the uterus.

Rupture of Membranes.—When the membranes have done their work of dilatation they are useless, and their persistence is even harmful, and under the most favourable conditions they rupture at this time. The os is sufficiently dilated when it has reached a diameter of three to three and a half inches, for then the occipital end of the head can enter and easily complete dilatation. If the membranes are thin they rupture before this, if too tough they remain intact longer.

The disadvantages of too early or too late rupture to the normal progress of the third stage of labour will be made clear further on.

Modes of Rupture of Membranes.—The usual place for rupture to occur is somewhere on the free surface, most commonly, no doubt, about the centre (1), as this is the least supported point. The tear may be made, however, just inside the ring of the os (2), or even higher still (3), (fig. 126).

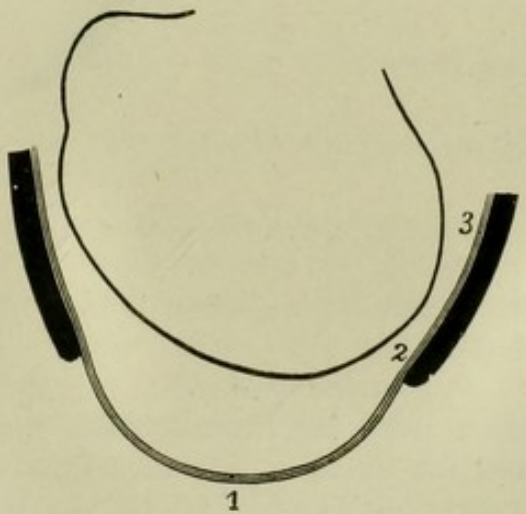

Fig. 126.—Rupture of membranes. 1, usual situation; 2, just inside the os; 3, some way up in the cervix.

In the first case the fore-waters escape, and the occipital end of the head comes down and takes the place of the bag of membranes at the os. In the last two cases the head comes down, but in the higher position of rupture (3), certainly, and in that just within the os (2), possibly, it covers the rent, and a second collection of liquor amnii takes place (fig. 127). As the head moves down during labour, the rent is carried with it below the level of the

os, and the second collection of fore-waters escapes. Two successive bags of membranes are thus produced, and this might, if the condition be not recognised, give rise to confusion.

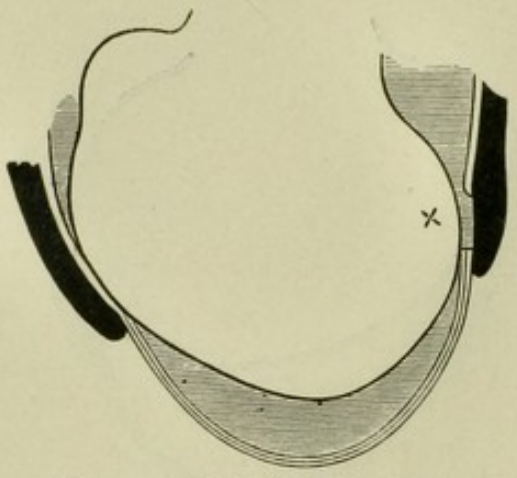

Fig. 127.—Formation of a second bag of waters.

Two successive discharges of fluid may be brought about in other ways; in one, the two layers of membranes, the amnion and chorion, are separated from one another by a layer of fluid (see diagrams of Development of the Membranes), and this amnio-chorionic fluid (*Ch. A*, fig. 128) may bulge the chorion away from the amnion over the area of the os. If the chorion now ruptures alone, there will still remain the bag formed by the general amniotic sac as usual. In another, there is a collection of fluid in connection with the decidua (fig. 128), between the decidua vera and decidua reflexa, and if this collection is near enough to the internal os, the advance of the ovum and the withdrawal of the lower uterine segment will bring the fluid into the area of

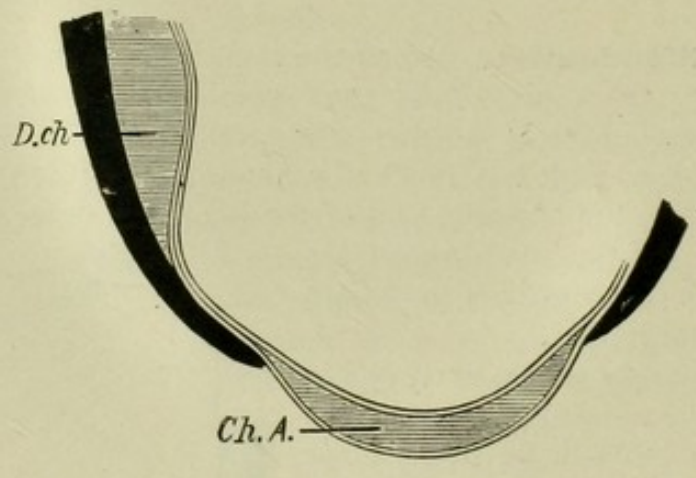

Fig. 128.—*Ch. A*, fluid between chorion and amnion; *D. ch*, between chorion and decidua.

the expanding os, when it may be discharged and expose the true bag of membranes.

Protrusion of Amnion through Chorion.—In some instances, even where there is no intermembranous fluid, the chorion sometimes ruptures alone and the amnion protrudes through it (prolapse of amnion). This involves some considerable separation between the two membranes, which must increase as the amnion advances, for the chorion remains attached to the decidua. This separation will, in all probability, lead to some retention of chorion.

Too early and too late Rupture of Membranes.—If rupture happens before the cervix is nearly dilated, the head, or whatever part presents, has to do the work of dilatation, and for this it is a clumsy instrument compared to the normal one. Instead of the force of hydrostatic pressure, which insinuates itself into the smallest orifice and then works without friction and radially

on the circle to be dilated, we have an obtuse wedge, with the drawbacks of friction and of decomposition of forces. This disadvantage is removed to a very slight degree by the formation of caput succedaneum on the area of the head in the ring of the cervix. Owing to its consistence, the caput may be considered to have a slight hydrostatic character, and it certainly makes the wedge of the head somewhat more acute.

The child in this case runs some risk from longer continued compression of its head.

The cervix, too, suffers from this anomaly; it becomes lengthened to an abnormal degree, and the anterior lip is frequently carried down in front of the head for some distance, and then becoming œdematous, causes delay in labour, and is possibly injured by being torn or so much compressed between the head and the pubes that it afterwards sloughs.

Late rupture is a disadvantage. The fœtus and the whole amniotic sac have to pass through the birth-canal together until the membranes do give way. This means detachment of a considerable area of membranes (if not the whole, including the placenta) from the uterine wall. If the placenta is detached to any measurable degree now, there will be considerable bleeding behind the ovum, and the condition of Accidental Hæmorrhage will be developed (see p. 336). Complete separation of the ovum is very rare, but it may happen in the case of premature children; and in these cases the whole ovum is occasionally expelled entire. Up to the sixth month or so this is not extremely rare, and even at term, or very near it, the child has been expelled in the still entire amniotic sac.

When the bag of membranes presents at the vulva the condition has been called 'prolapse of the bag.' In this case the membranes give way as the head clears the vulva, and the child is often expelled with a segment of the membranes over its head: it is then said to be born with a 'caul.' The uterus is by too late rupture deprived of the stimulus which it normally gets from the contact of its walls with the fœtal parts.

Too early or too late rupture has also an unfavourable influence on the third stage of labour, as we shall see later (p. 124).

After rupture and escape of the fore-waters, the head, no longer kept back by the pressure of this fluid, comes down well into the os. As it does so, a variable amount of the liquor amnii behind it escapes, but the whole quantity is prevented from running away by the head filling the ring of the cervix, which it fits especially tightly during a pain. The uterus, as the liquor amnii runs off, is able to contract and retract on to the body of the fœtus; and the fresh stimulus produced by this contact with an irregular more or less hard body converts the pains of dilation into those of expulsion.

There is often an interval of quiescence immediately after the rupture, during which the uterus is retracting on to the child.

Anatomy of Soft Parts during and at the end of the First Stage.—There is but little alteration in the relative positions of the pelvic viscera during this stage, but at the end of it the bladder is found to be drawn by the rising cervix, and pushed by the descending lower pole of the ovum, upwards and forwards; and the vagina is beginning to expand at its upper end (fig. 129).

The upper uterine segment has retracted to a varying extent and is now gripping the fœtus, closely or not according to the amount of liquor amnii

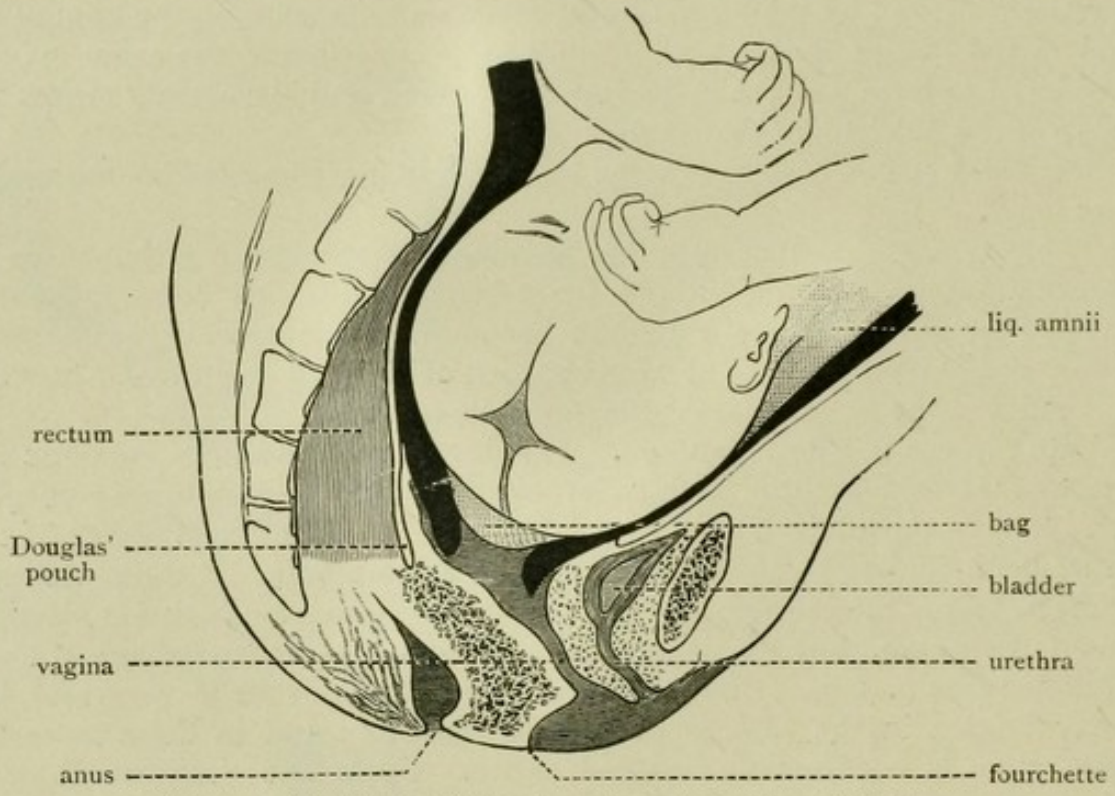

Fig. 129.—First stage of labour : no change in position of bladder.

drained away ; and the head of the child, now meeting for the first time the resistance of the brim, becomes more flexed.

Second Stage

During this stage of labour the fœtus is expelled.

The typical second-stage pains develop when the head reaches the pelvic floor. It then meets the resistance of voluntary muscle, and the voluntary expulsive muscles—namely, the diaphragm and those of the abdomen (see fig. 111)—come into play. This type of pain is, however, appearing at the beginning of this stage, and the woman is conscious of something occupying her pelvis which has to be expelled.

The head can be felt on vaginal examination to be descending at each contraction, and to retire when the force is removed, owing to the elastic pelvic resistances. The amount of retreat is of course less than that of advance, and some progress is made at each pain.

When the pelvic floor is reached the head meets with an elastic barrier lying nearly across its path. Under pressure this barrier is ready to alter its position of nearly a right angle to the present path of the head into one of a more obtuse angle, the head changing its direction at the same time to one more forwards than before. It can do this, for now it has got its anterior pole below the pubic arch (see fig. 130), and the head is becoming free to move forwards as far as bony resistances are concerned. So that the downward and backward path of the centre of the head is changed in direction by this obliquely acting force, which is a constant one, and the head now moves more and more directly forwards.

If this part of the pelvic canal be divided in imagination into a series of zones, the greatest circumference of the head is seen to pass through each of them in succession. As the circumference approaches any one of these zones, the latter forms a resistance to the head's progress, and after the circumference has passed the zone, this contracts behind it, and helps to push it onwards in the axis of the birth-canal in a peristaltic manner.

The pains are now of the typical expulsive character. The woman has an almost irresistible impulse to bear down with all her might at each contraction of the uterus, feeling there is a mass to be expelled. She fixes her diaphragm after a deep inspiration by closing the glottis, and then contracts her abdominal muscles. If she cried before, she is silent now, at all events at the height of a pain, and she concentrates her attention on the one object of expelling the child, occasionally taking breath during a long pain and making a fresh effort.

The pains now follow each other more rapidly and last longer.

When the perinæum is being distended the agony at times is so great that the woman interrupts her now almost involuntary bearing-down efforts to cry out. This cry necessitates the opening of the glottis, and the pressure is thus at once taken off the abdominal contents, and therefore off the perinæum. Tearing of this part is thus for the moment avoided. The glottis, as was pointed out by Tyler Smith, acts in this way as a safety valve for the perinæum.

We left the head impinging on the floor. In accordance with what has been already said, the occiput, being the first-coming part of the head, glides along the sloping pelvic floor to the vulva, and is forced under the pubic arch. It is the first part to distend the vulva, and it now presents at the vaginal orifice.

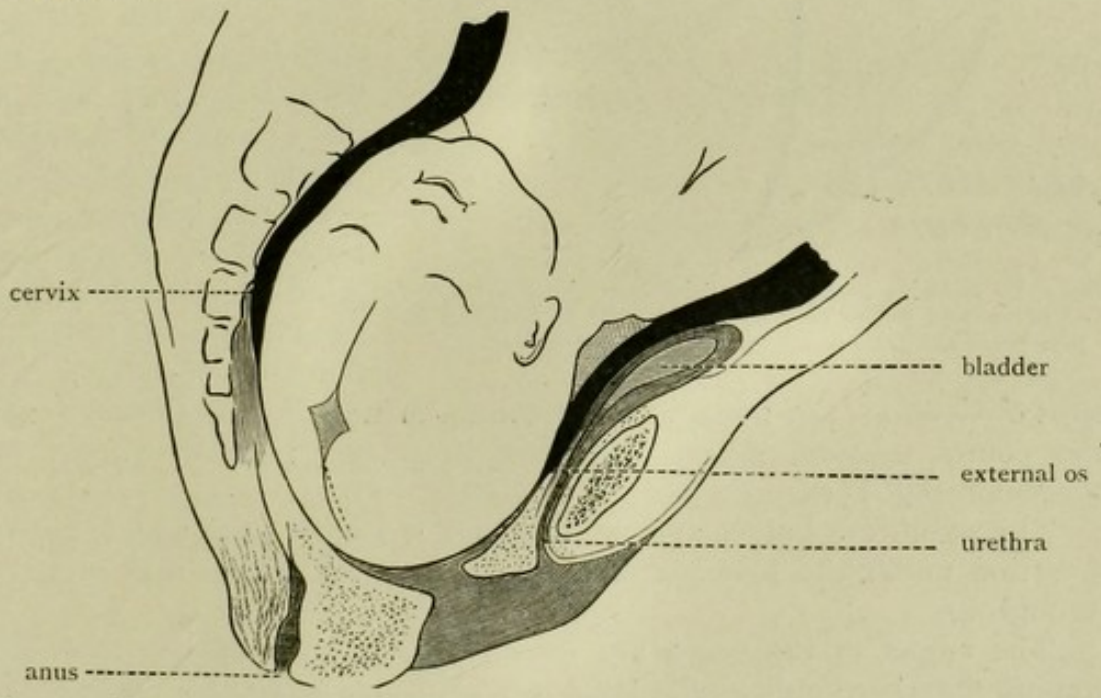

Fig. 130.—Second stage, showing the altered position of the bladder, and the thickening in the uterine wall just above the bladder.

Anatomy of Labour when the Vulva is beginning to dilate.—By this time the shoulders are just above the level of the cervix. The uterus

has retracted on to that part of the fœtus remaining inside it, and the differentiation between its upper and lower segments has become marked; unless the second stage has so far been a very easy one. If it is well marked, the line of division may be felt above the pubes through the abdominal wall as a depressed line running across the uterus, often very obliquely. The longer this stage has lasted, the more easily felt will this Ring of Bandl be.

The bladder is now wholly above the pubes, and the urethra is elongated mainly from this cause, but also because the tissues below and behind the pubic arch are pushed down somewhat by the descending head, and the lower end of the urethra with them. It is also compressed and its direction rendered more vertical, as it lies parallel to, and tightly jammed against, the symphysis. Catheterism is thus made somewhat difficult, and micturition practically impossible (see fig. 130).

The structures attached to the sacrum and coccyx, consisting of the rectum, posterior vaginal wall, and perinæum (fig. 131), are pushed downwards and backwards by the descending head, and form the posterior half of an arrangement like a pair of folding-doors, one of which opens inwards and the other outwards, the inward-opening one being the bladder and anterior vaginal wall as described by Berry Hart.[1]

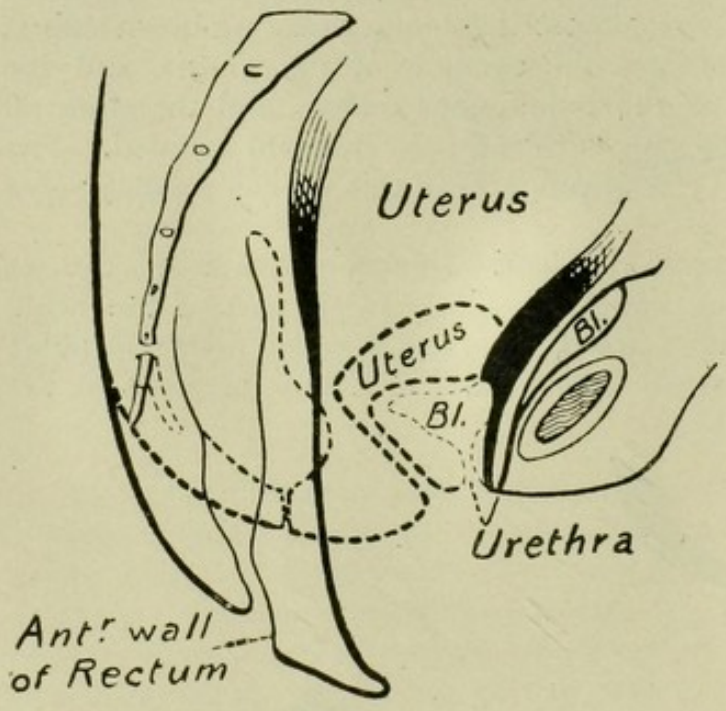

Fig. 131. - Showing change in position during labour of floor of pelvis and pelvic viscera. A dotted line indicates the position of the parts in the unimpregnated woman.

As the head sweeps down past the posterior valve it compresses the rectum, and completely empties it of any fæces there may be in it. In the process of lengthening which the perinæum undergoes, the anterior and posterior walls of the rectum glide one over the other, the anterior moving further down than the posterior. This is most obvious at the anus, where the anterior wall is considerably exposed, and comes to form, when distension is getting marked, a part of the perinæum (fig. 131).

The perinæum bulges and thins in both a longitudinal and a transverse direction under the pressure of the head, and the sutures may often be felt through it.

The edges of the vulva are forced apart by the occiput at each pain, coming together again as the head retreats in the intervals ; and as the skin of the hairy occiput appears, it is seen to be wrinkled from compression of the underlying bones.

[1] *Atlas of Female Pelvic Anatomy*, pp. 56–67.

Gradually larger and larger diameters occupy the vulva, which is correspondingly stretched, and when the sub-occipito-frontal—the largest distending diameter—begins to engage, the perinæum in primiparæ usually shows signs of beginning to tear at its anterior edge, if it has not done so before. The head is sometimes fixed at this stage for a few moments, and does not retreat when the pain goes off. This is called by the old nurses the 'crowning,' and it shows that the perinæum is elastic and will probably not tear. Occasionally the fourchette even is found afterwards not to have been torn, but this is very rare. The stress of labour is now at its height, and the safety-valve action of the glottis is most valuable. The greatest diameter clears itself, and *extension* of the head occurs with almost a jerk to an extent which sometimes clears the chin, and sometimes only carries the perinæum as far as the glabella or the mouth. The occiput now lies in front of the symphysis, the sub-occipital angle being tightly pressed against the lower edge of the pubic arch (fig. 158).

The next pain frees the head if it has not yet escaped, and after the neck has been gripped by the vulva for a short time, usually for a pain or two, the shoulders come down and distend the opening. With the head the most resistant part has been born, and there is no difficulty with the shoulders, except that occasionally the cord is found round the child's neck, and if it is not freed by pulling down a little more of it and passing the loop over the child's head or over the shoulders, sometimes gives rise to danger of strangulation of the neck, or rupture of the cord, or detachment of the placenta.

The body follows at once on the shoulders, and is accompanied by a gush of the remaining liquor amnii, and some blood, as a rule, from laceration of the cervix, and perhaps also from partial detachment of the placenta.

The contracting uterus follows the last portion of the child down. Felt through the abdominal wall, it is found to rapidly diminish in size to about that of a five-months' pregnancy—that is, just below the navel. It is now closely retracted on the placenta and the small amount of blood-clot often lying behind that (figs. 133 and 137). Its shape during a contraction is flattened, and the edge of the fundus is plainly felt; in the intervals it becomes a rather indefinite mass, which has about the same size.

This ends the second stage of labour.

Formation of Caput.—As the fœtal head descends in this stage the scalp is much wrinkled, and the bones of the vault overlap at the sutures. In addition, a caput succedaneum is found to develop more or less in all cases. This swelling is formed on the leading part of the head (p. 108). In the mechanism of the first vertex, if produced mainly in the vagina, it lies over the right parietal bone, rather nearer the posterior than the anterior upper angle, and close to the sagittal suture. As the head descends through the vagina and rotates, the occipital end tends to come into the presenting area, and the œdematous lump moves towards and partly on to this bone. As the resistances are greatest at the pelvic floor, the caput formed at this stage is more marked than that caused in the higher parts of the canal—for instance, at the cervix.

The stages at which a caput may form are, to recapitulate :

In the first stage—

(*a*) Before membranes have ruptured by close fitting of head (p. 106).

(*b*) After rupture, owing to resistance of ring of cervix.

In the second stage—

(*a*) In the upper and middle parts of the vagina.

(*b*) At, or nearly at, the vulva.

The exact situation of the caput, which varies according to the position of the head, will be mentioned as the mechanism of each position is described.

It is interesting to notice how during the first stage of labour, while the resistance to be overcome is that of involuntary muscular fibres—namely, the lower segment and cervix—the expelling force is that of involuntary muscle ;

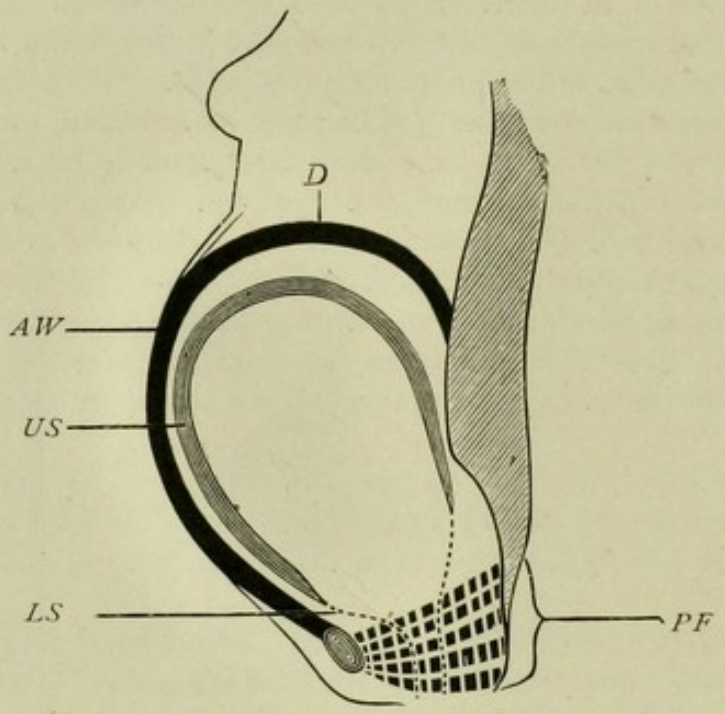

Fig. 132.—Opposition of voluntary and involuntary muscles in labour. *D*, diaphragm ; *A W*, abdominal wall ; *U S*, upper segment ; *L S*, lower segment of uterus ; *P F*, pelvic floor. The continuous lines represent the forces, the thin lines of involuntary muscle, the thick ones of voluntary. The dotted lines represent the resistances, the fine dots (as at *L S*) the involuntary, the heavier dots the voluntary (levator ani).

when, however, the pelvic floor containing voluntary muscles (levator ani, &c.) has to be dilated, the expelling force has added to it the action of the voluntary muscles—namely, the abdominal muscles and diaphragm (see fig. 132).

CHAPTER XV

PROGRESS OF LABOUR—*continued*

THIRD STAGE

THE third stage of labour is occupied in the expulsion of the placenta and membranes.

After the child is born the uterus ceases to contract with vigour for a variable time, usually for a quarter of an hour, or in many cases for somewhat

longer. An hour, or even more, cannot be regarded as abnormal, as long as there is no bleeding going on.

Retraction is in progress all the time, and there are occasional slight contractions, resembling those which take place during pregnancy.

The woman is able to recover somewhat from her past exhaustion.

Events are now going on in the uterus which involve the separation and expulsion of the after-birth.

Separation of Placenta and Membranes.—It will be remembered that the decidua vera and serotina are divided into three layers at the end of pregnancy; the middle layer is the one concerned in the process of separation (see p. 6, and figs. 8 B and 12).

On the uterine aspect of this layer is the deeper part of the decidua, which remains attached after the uterine contents have been expelled; and on the fœtal aspect, between the middle layer and the modified (placental) or unmodified chorion is the superficial part of the decidua, which is cast off with the chorion and amnion—in one part as unchanged decidual structure, and in another as the maternal part of the placenta. Recently the mechanism of detachment and expulsion has been more perfectly studied.

Separation of Placenta

There are three modes of separation described—namely, by:

1. Reduction of the placental site by uterine contraction and retraction.
2. Detrusion.
3. Extravasation of an appreciable amount of blood between the placenta and the uterine wall.

We will consider them in turn.

1. *Reduction of the Placental Site.*—The placenta is comparatively inelastic, and cannot follow its diminishing site. It has been shown in certain cases[1] that the placental site may be diminished to an area 4 in. by 4 in. without separation (the initial diameter being 7 to 8 in.).

The detachment, according to this method, would begin at the edges of the area and advance to the centre, supposing the edge of the placenta be not disturbed (fig. 134). If, however, one edge of the placenta were carried along with the edge of the site (fig. 135)—the upper edge pushed down by the descending fundus,

Fig. 133.—Uterus in third stage, showing non-detachment. The figure also shows the thinness of uterine wall at placental site. *Pl*, placenta. (After Barbour.)

[1] Barbour (*Edin. Med. Jour.* No. CDLXXXIV. October 1895, p. 301) believes that often the placenta does not begin to separate until the commencement of the third stage of labour; that its texture is such that it can accommodate itself to the shrinking of its site until the uterus contains nothing but placenta without separation taking place; that there is no empty space in the uterus into which the placenta can bulge; and that there is not sufficient evidence to support the view of Baudelocque and Schultze that retro-placental hæmorrhage is a factor in its separation. See also Pestalozza, *Anatomia dell' Utero Umano*, Milan.

for instance—the detachment would begin at the lower edge (fig. 135), and would take place by detrusion.

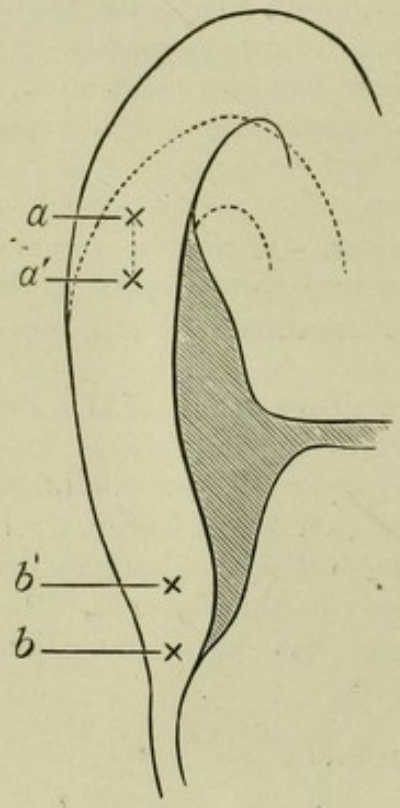

Fig. 134. Separation of placenta. Site shrinks from *a b* to *a' b'*. Detrusion would not occur till the fundus reached the position shown by the dotted lines.

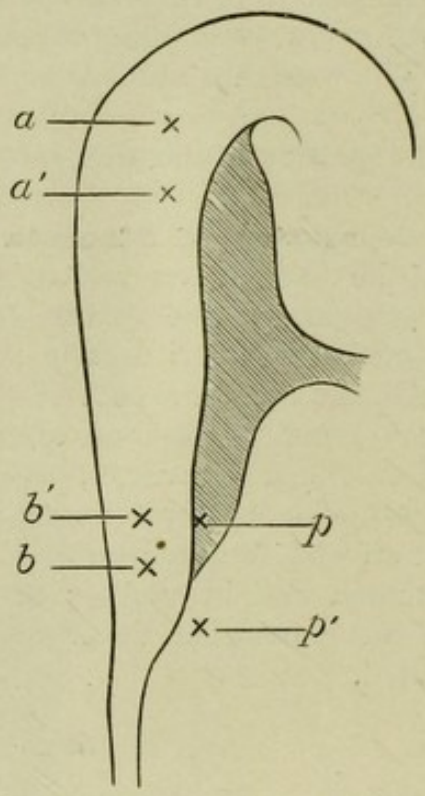

Fig. 135.—Separation of placenta. Detrusion as site shrinks from *a b* to *a' b'*. By the movement of *a* to *a'* the whole placenta is pushed down, *p* moves to *p'*.

2. *Detrusion.*—It is considered by some observers that detrusion is the sole factor in detachment. Barbour believes that detachment does not begin till the uterus has contracted down so as to contain nothing but placenta. He is supported in this view by a number of frozen sections.

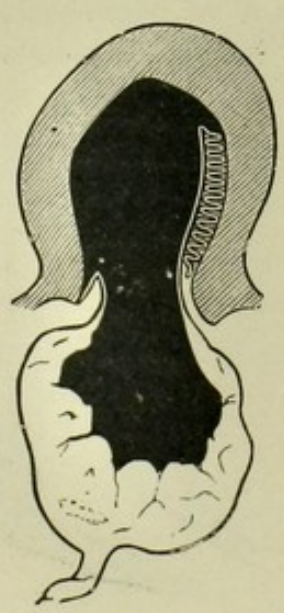

Fig. 136.—Expulsion of placenta (according to Schultze).

3. *Sub-placental Hæmatoma.*—This extravasation is said to be effected by the uterine muscle during contraction squeezing all the blood in its walls into the least contractile (fig. 133) (and already more vascular) part of it—namely, the placental site. The hæmatoma has been accounted for in another way—namely, by the aspiration of blood from the sinuses by the vacuum formed in the folding placenta.

If this were the principal cause of detachment, as believed by Schultze, whose diagram illustrating the process has become classical and is here reproduced in outline, the placenta would be always completely inverted during its expulsion into the vagina. This is by no means the case.

We have thus three methods of placental separation, each of which is advocated in turn as being *the* mode, but all of which agree in assigning as the fundamental cause the processes of retraction and contraction.

Matthews Duncan believed that complete absence of hæmorrhage is the natural state, and that this is due to the fact that in retracting and contracting the uterine muscle separates the placenta by causing the placental site to shrink, and by the consequent compression of the torn blood-vessels prevents the bleeding which would occur.

Now absolutely bloodless labours are never found, and Champneys[1] believes that hæmorrhage caused by rupture of vessels does play a certain part in the detachment of the placenta.

To summarise. The placenta is separated by contraction and retraction of the uterus in the following way.

Shrinkage of the placental site separates the placenta, beginning at the edge and advancing to the centre, if the surface of the uterine wall around

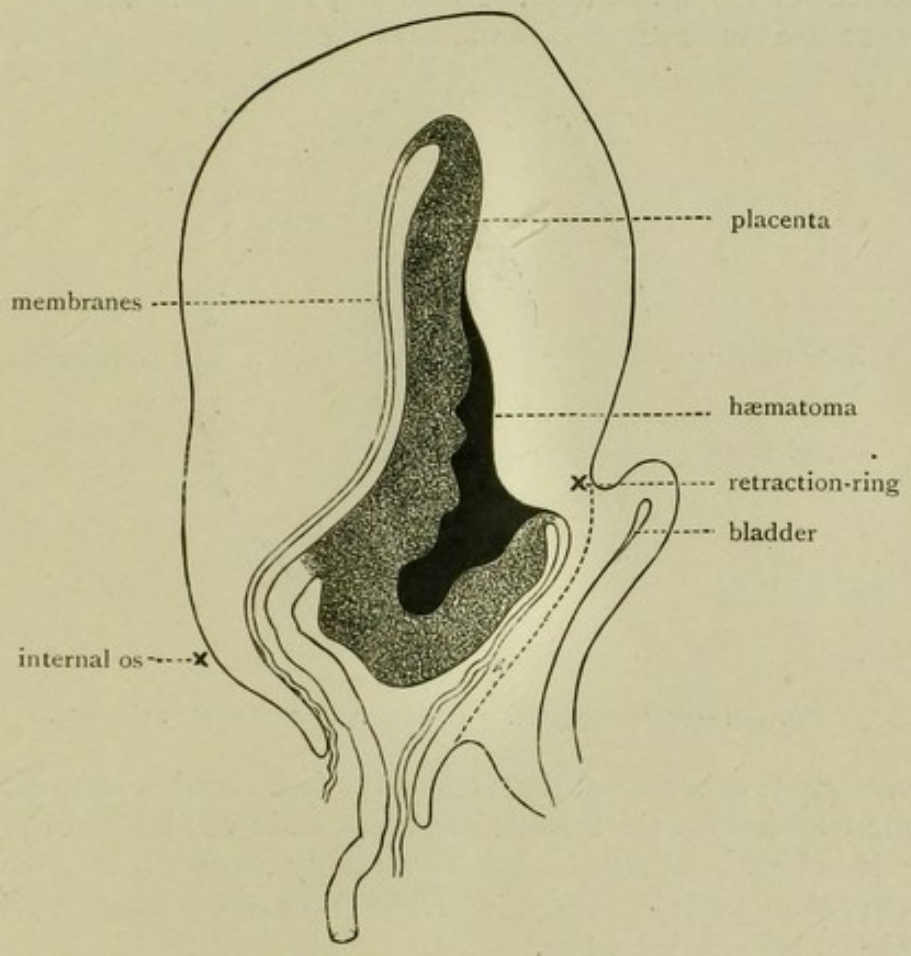

Fig. 137.—Detachment of placenta, × × at internal os.

the site has no abrupt curve preventing it from gliding underneath the edge. If, however, the fundal angle fits closely against the upper edge, detachment will begin at the lower edge, and detrusion will play an important part. Detrusion must, in any case, complete the process of detachment. If any part of the placenta has become abnormally adherent, this part will form the centre towards which separation by shrinkage will advance.

Vessels will necessarily be torn across at the earliest moment of separation, and some hæmorrhage will occur.

[1] Reference on p. 125, footnote.

Antecedent to, or at the same time as, commencing separation, blood is being extravasated into the trabecular spaces at the plane of utero-placental union, owing to the squeezing of blood into the subjacent vascular area, and this helps separation to some extent, and renders easier the shrinking of the placental site away from the placenta.

It should be mentioned that complete separation has been found at the end of the second stage (Lemser), though this, according to recent observations, is quite exceptional.

Separation of Membranes

The production of a 'bag of membranes' descending into and below the cervix necessitates some separation of the lower pole of the ovum from the lower segment of the uterus (figs. 119 to 125), which is drawn up off the bag. This process goes on until the membranes rupture.

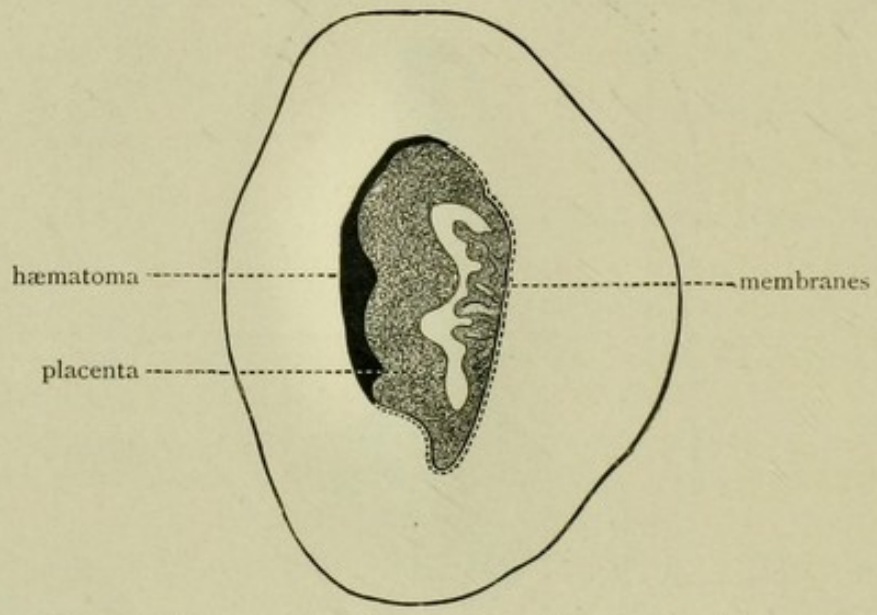

Fig. 138.—Transverse section of uterus. Detachment of placenta.

When rupture occurs and the uterine surface shrinks, the comparatively non-elastic membranes are thrown into folds and wrinkles (fig. 138), and thus partially detached, or at all events considerably loosened, in places. While the placenta is in process of expulsion it peels the membranes, as it descends, completely off the uterine walls.

The amnion has already been described as the layer which confers toughness on the membranes. It is therefore of the greatest importance that the chorion remain firmly united to it throughout this process. Failure to adhere is liable to result in some of the chorion being left behind in the uterus—a most dangerous state of things, as will be seen later. Apart from morbid conditions of the chorion or of the decidua, leading to separation of these structures from the amnion as the latter follows the placenta out of the uterus, separation may be caused by too early or too late rupture of the membranes in the first stage of labour.

Too early rupture prevents the separation of the lower pole of the ovum, since then there is no bag of waters formed, and the membranes adhere to

the uterine wall too closely. This interferes with that part of the normal mechanism of the detachment of the membranes which takes place before rupture.

Too late rupture means that the bag of membranes is prolonged far down into the vagina. The chorion is almost bound to give way, and the amnion will advance alone. The chorion will then lose the advantage of adhesion to the amnion, and some may be left behind.[1]

Expulsion of Placenta and Membranes

The mechanism of expulsion varies slightly in different cases, but the differences are only matters of degree, and the main plan is as follows. The sub-placental extravasation causes a slight inversion of the placenta (fig. 137), and as this body is pushed down by the diminution in cubic capacity of the uterus, or earlier by detrusion, it has to detach the membranes from the segment of uterus below the site as it descends. This delays the

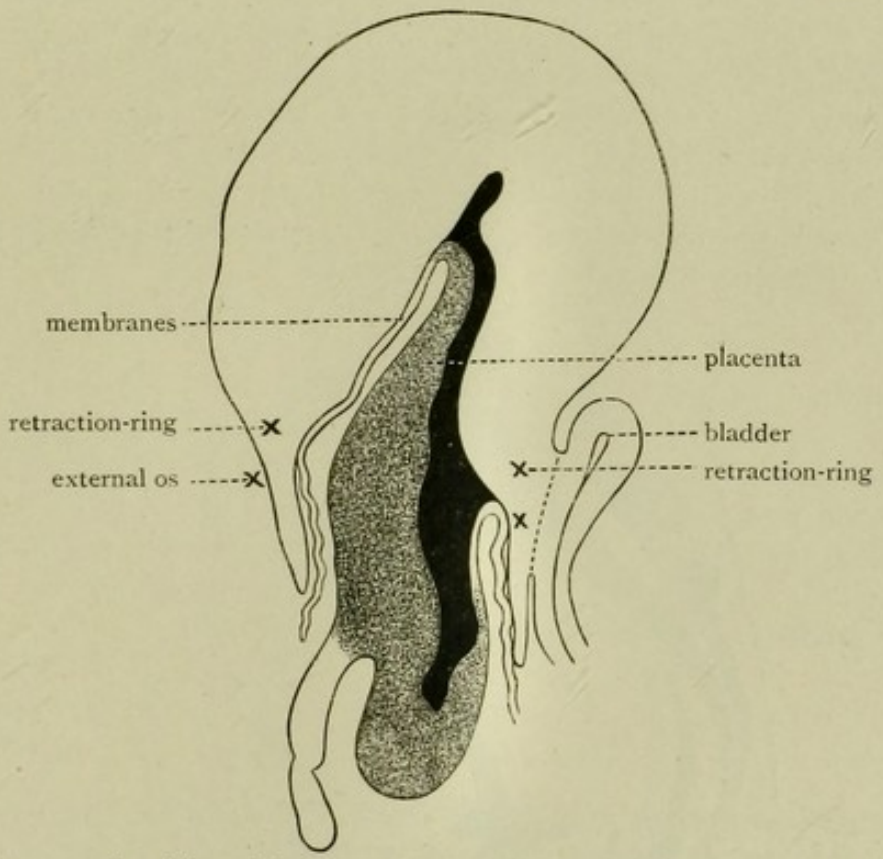

Fig. 139.—Expulsion of placenta. The lower × in front marks the internal os.

advance of the lower edge ; and the higher the implantation of the placenta on the uterine wall, the more membrane it has to detach, and so much the later the lower edge lags behind the point on the amniotic surface which presents at the os. The placenta never, unless its lower edge was originally close to the internal os, presents by its edge, but by some spot on its fœtal surface from $\frac{1}{4}$ to $3\frac{1}{2}$ in. above its lower edge, in most cases about 2 in.

It is in a form of slight inversion at its lower edge (fig. 139), but is of

[1] See Champneys, *Mechanism of the Third Stage of Labour.* 'Some Causes of Retention of the Membranes,' *Obst. Trans.* vol. xxix. 1887, p. 317

course bent backwards on a vertical axis with its fœtal surface inwards following the curve of the internal uterine surface (fig. 140).

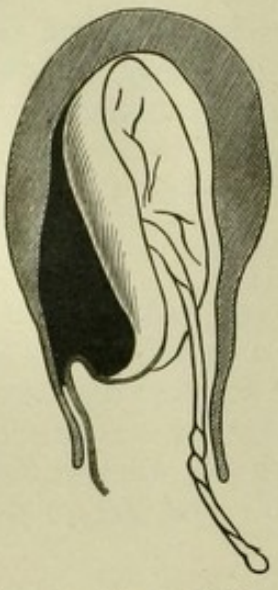

Fig. 140.—Shape of placenta during expulsion.

Very complete inversion is probably due, as Duncan believed, to traction on the cord.[1]

The uterus is to some extent detaching the placenta by retracting during the interval of rest, but expulsion into the vagina does not happen until the pains reappear. Two or three pains are usually enough to effect this. Abdominal contractions are now required to force the placenta out of the vagina, for the vaginal muscle has been too much stretched to carry out this unaided.

The membranes, as they are dragged out after the placenta, are seen to be inverted (fig. 139 shows the commencing inversion), the amnion being outermost; and the whole mass is accompanied by a variable amount of clotted and fluid blood from the placental site. This blood comes partly from the sub-placental hæmatoma, and partly, especially the fluid portion, from the site after separation.

When the after-birth has been expelled, the uterus is found contracted and retracted down to about the size of a fœtal head, though varying in size in different women, according to the amount of retraction, and often according to the size of the child.

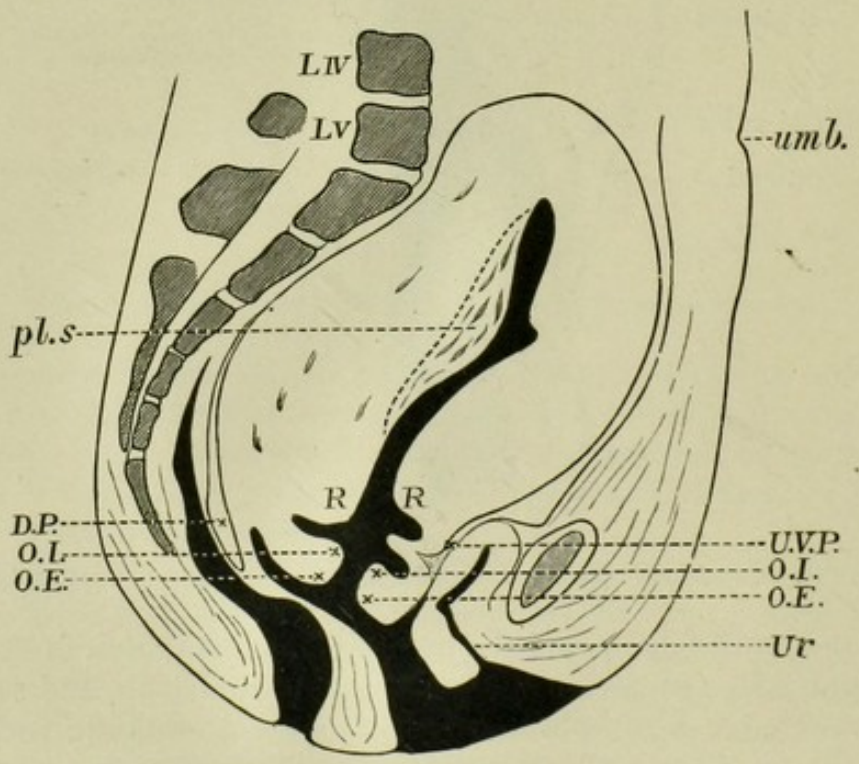

Fig 141.—Uterus just after end of third stage. *L* IV, *L* V, lumbar vertebræ; *pl. s*, placental site; *D P*, Douglas' pouch; *O I*, os internum; *O E*, os externum; *R R*, retraction ring; *U V P*, utero-vesical pouch; *Ur*, urethra; *umb*, umbilicus. (After Webster.)

[1] These views partake more of the character of Schultze's ideas than of Duncan's. Schultze thought that the normal way for the placenta to be expelled was in an inverted form (see fig. 136); Duncan maintained that the normal mechanism was for the edge to

Some of this diminution in size is due to contraction alone, as within a few hours of the completion of labour relaxation occurs and the uterus is found to have again increased in bulk.

In the meantime slight relaxations take place now and then, lasting for a minute or more ; and during their presence the uterus loses its definite outline, and sometimes a little care is required to find it.

No blood is lost, however, in these intervals of relaxation, as a certain amount of tone remains, sufficient to keep those vessels closed which are not thrombosed. (It cannot be said that the uterus has *retracted* down to this size, as it increases afterwards, and it is probable that contraction is in some degree continuous at this stage.)

Labour is now over, and the puerperal period has begun.

Amount of Blood lost at Labour.—The average amount of blood, taking clots and fluid blood together, is four ounces before the placenta is delivered and six ounces [2] with the placenta and membranes. The blood is mixed with liquor amnii, and it is not easy to fix its exact amount.

The total quantity varies within wide limits which may be considered normal. It is found that those women who habitually menstruate profusely also lose more than others during labour ; and they have been found to behave in the same way as regards the lochial discharge afterwards.

Duration of several Stages of Labour.—The time taken up in each stage varies principally according as the woman is a primipara or a multipara. The relation of the first stage to the second is fairly constant—namely, about six to one.

In multiparæ the average length of the expulsive stage is one to two hours out of a total nine or ten.

In primiparæ the expulsive stage lasts about three or four hours out of twenty : in some elderly primiparæ, where the cervix and perinæum are less easily dilated, four to five hours out of twenty-four. The following are about the average figures :—

	1st stage	2nd stage	Total
Multiparæ	8	1–2	10
Primiparæ	16	3–4	20
Elderly	20	4–5	24

It happens almost as a rule that in the absence of abnormality the relative length of the first and the second stage vary inversely as one another, a long first stage being succeeded by a proportionately short second, and the converse. If the first stage has been prolonged, the parts below have had time to become more softened and easy of dilatation.

The increased length of labour in elderly 1-paræ depends to a slight

come first. A series of observations recorded by Champneys are the basis on which the statements in the text are made (see *Obst. Trans.* vol. xxix.) The membranes follow the placenta down, and the mechanism of their detachment is also that of their expulsion.

[2] Average of 100 cases observed in the General Lying-in Hospital. These figures pretty well agree with those of Champneys (*Obst. Trans.* vol. xxix. p. 166), who says six ounces before, and six with.

extent on the increased ossification and possibly larger size of the fœtal head in their case (see p. 31). The same effect is observed on taking the average of a large number of cases, when the duration of labour in the case of male children is compared with that when a female child is being born.

Time of day at which Labour takes place.—Most labours begin, and most end, between 9 p.m. and 9 a.m.

Cause of Labour.—It is not quite clear why at the end of ten lunar months the uterus should begin to contract sufficiently vigorously to detach and expel the ovum. There is some sort of an analogy in the ripening and shedding of fruit. In none of the reasons assigned is there anything to be found but a suggestive hypothesis of the mode in which this cause acts. Thus it has been said that the change in the sinuses (p. 43) occurring at the end of pregnancy leads to an accumulation of carbonic acid gas in the placenta, and that this acts as a stimulus to the uterus; or that the growth of the ovum beyond a certain size overstretches the uterus. Spiegelberg[1] suggests that the only explanation possible is that of 'some substances gradually accumulating in the maternal blood as maturity approaches and arrives; which substances had till then been used up by the fœtus, but are so less and less, till at a certain point the fœtus can no longer make use of them, since it requires the substances for its further development. (It is for this reason that the mature extra-uterine fœtus perishes.) These substances . . . call the motor centres of the uterus into activity.' It will be remembered that labour usually occurs about the time when menstruation would have been due for the tenth time after conception, and the habit the uterus (or rather its motor centre) has of becoming active once a month is no doubt a most important factor. Calculations of the day when labour will occur are made on this basis, and are very fairly accurate as a rule.

CHAPTER XVI

GENERAL MECHANISM OF LABOUR IN VERTEX POSITIONS

THE fœtus has been described as an ovoid body made up of two lesser ovoids; a larger, the body-ovoid, and a smaller, the head. We have now to study the various lies in which the composite fœtal ovoid may be found.

The ovoid may lie above the brim with its long axis coincident or nearly so with the axis of the brim. All normal lies, whether cephalic (head lowest) or pelvic, are in this class, and all lies in this class are normal except certain rare attitudes of the fœtus in the cephalic lie—namely, brow presentations. The fœtal ovoid may also lie with its long axis at something near a right angle to the axis of the brim, constituting a transverse lie. All transverse lies are abnormal.

[1] Spiegelberg, *Text-book of Midwifery* (Eng. Trans. New Sydenham Soc.), vol. i. p. 172.

Cephalic Lies

With the head downwards the attitude of the fœtus may be one of flexion, of extension, or of a posture midway between the two.

In the case of flexion, the larger end of the head-ovoid forms the end of the whole fœtal ovoid (fig. 142). This is a vertex presentation.

Fig. 142.—Flexion, vertex presentation.

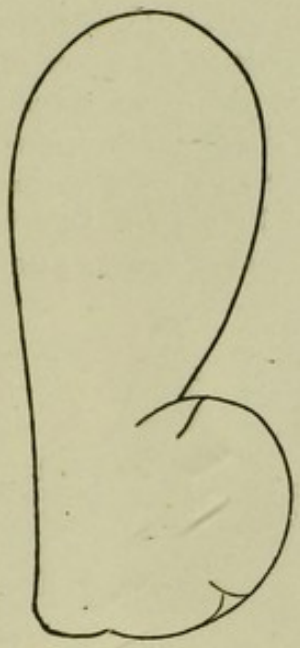

Fig. 143.—Extension, face presentation.

Fig. 144.—Attitude between flexion and extension, brow presentation.

If the head is extended, the smaller end of the head-ovoid forms the end of the general fœtal ovoid. This is a face presentation (fig. 143).

The long diameter of the head-ovoid may lie at right angles to the body-ovoid, and the attitude is one between flexion and extension. This is the abnormal presentation just alluded to, brow presentation (fig. 144).

Vertex Presentations

Flexion is the usual condition of all the joints of the fœtus, and so vertex presentations are by far the most common of all. They occur in 95 to 96 per cent. of all cases of labour. (Face presentations (extension) occur in about ·4 per cent.)

With the vertex presenting and the head moderately flexed on the trunk, a diameter near the occipito-frontal diameter is seen to be the longest diameter of the head in the plane of the pelvic brim (fig. 145).

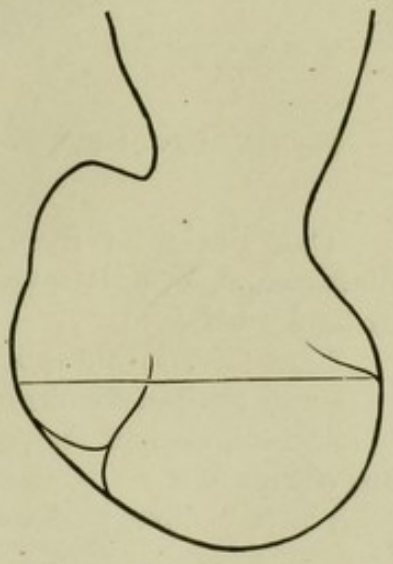

Fig. 145.—Relation of head to brim (horizontal line) in a primipara.

According to the relation of this diameter with the diameters of the pelvic brim in the plane of which it lies, the vertex, as will immediately be seen, may be in one of four positions.

The above diameter cannot lie in the conjugate, since this measures only four inches. The one in which it might be expected to lie according to relative measurements is the transverse (five inches),[1] and approximately this is so; the long diameter of the head always lies nearer to the transverse than to any other diameter of the brim when the head is once engaged.[2] Before the head enters the brim at all, however, the fœtus is acted on by the other forces already described (p. 34), which tend to place it in a definite position with regard to the walls of the genital canal.

Owing to these causes the long diameter of the head in the plane of the brim deviates somewhat from the exact transverse in nearly all cases even before the cavity, where the shape of the pelvis forces it into the oblique, is reached. It does not deviate as a rule, however, into an oblique diameter, as defined in Anatomy of Pelvis (p. 83), at the brim, but lies in the transverse with a slight inclination towards one or other oblique diameter.[3]

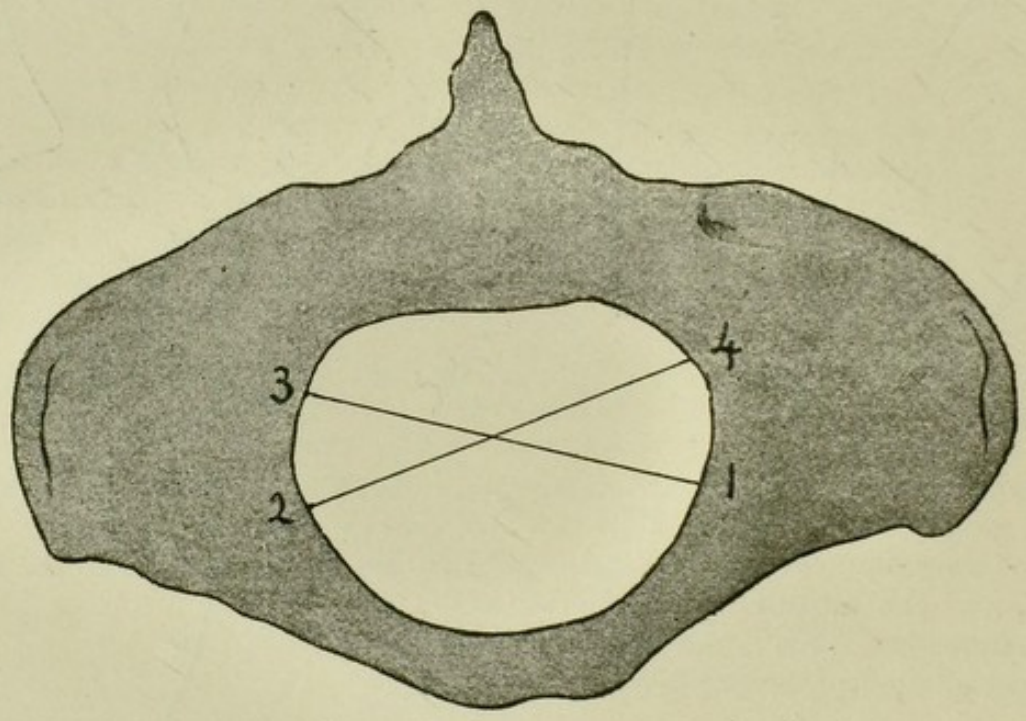

Fig. 146.—Pelvic brim from above. The figures represent the situation of the occiput in the four positions of the vertex.

This deviation from the transverse may be towards either oblique diameter, right or left, and in either case may lie with the occiput forwards or backwards.

Thus four positions are possible (fig. 146) :—

First, occiput forwards and to left (head in right oblique).

Second, occiput forwards and to the right (head with long diameter in left oblique).

Third, occiput backwards and to the right (head in right oblique).

[1] The shortening of the transverse diameter by the psoas muscles tends to cause the occipito-frontal diameter to lie originally out of the exact transverse.

[2] '*Engaged*' means that the presenting part has entered the brim far enough to be influenced in its movements in the plane of the brim by the shape of that bony ring.

[3] In a small number of cases, estimated at 20 per cent., of all vertex presentations, by Spiegelberg, the head enters the brim actually in an oblique diameter, Solayres' Obliquity.

Fourth, occiput backwards and to the left (head in left oblique).[1]

It will be seen that the positions follow one another round the brim in the direction from left to right, like the hands of a watch, if the pelvis is looked at from above; in the reverse direction if looked at from below (fig. 147). It will be noticed also that if the long diameter of the head is in the right oblique, the position must be the first or third; if in the left, the second or fourth, the direction of the occiput forwards or backwards deciding the point.

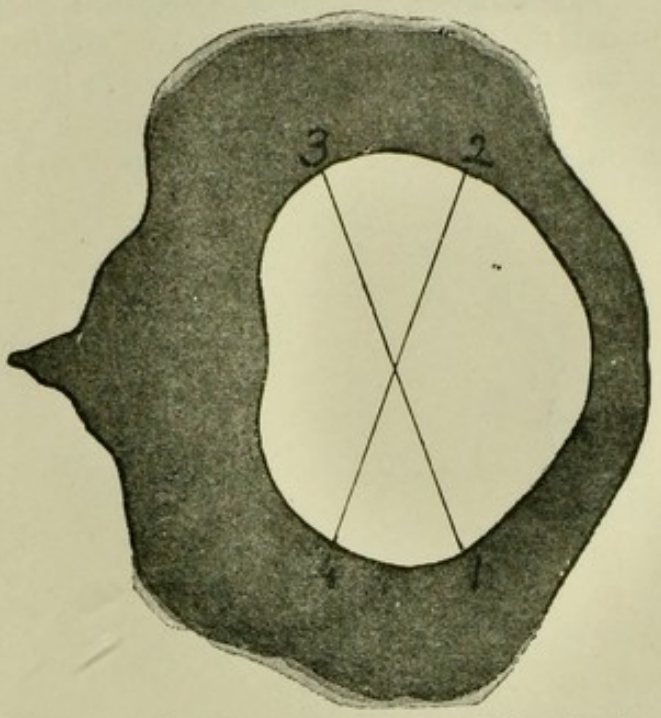

Fig. 147.—This figure represents the pelvis on its side in the left lateral position and seen from below. The numbers indicate the position of the occiput.

The occiput is towards the left in first and fourth positions, and towards the right in second and third positions.

In all positions the head in the beginning of labour lies deeply enough in the pelvis to be engaged at a level, a little nearer the vertex than the level of the occipito-frontal diameter (see fig. 145). The plane of the head coinciding with the brim may, however, be slightly above or slightly below this, according to the laxity of the lower uterine segment, the tone of the abdominal muscles, &c. In primigravidæ the head is usually lower than in multiparæ.

[1] On the Continent, the positions of the head have a different nomenclature in France and Germany respectively.

In France, the occiput being, as with us, the part of the head taken as the point of reference, the positions are named as follows:

Occipito-iliaque gauche-antérieure, O.I.G.A.
Occipito-iliaque droite-antérieure, O.I.D.A.
Occipito-iliaque droite-postérieure, O.I.D.P.
Occipito-iliaque gauche-postérieure, O.I.G.P.

corresponding to our first, second, third, and fourth positions. The transverse positions are named also:

Occipito-iliaque gauche-transversale, O.I.G.T.
Occipito-iliaque droite-transversale, O.I.D.T.

when the occiput points to the left and right respectively.

It may be mentioned that the meaning of the terms right and left oblique diameters of the pelvis are the inverse of ours, the right oblique diameter indicating that which ends at the right ileo-pectineal eminence, and the left that which ends at the left eminence.

In Germany the child is said to be in the first vertex position (*Schädellage*) when the occiput lies to the left side of the pelvis, and in the second when it lies to the right. The Germans consider our third and fourth vertex positions to be varieties of the usual vertex mechanism (*Vorderscheitelstellung*).

In America the Continental method of naming the oblique diameters is followed, and this must be remembered in reading American works on obstetrics.

We may now follow the head through the pelvis, starting from the first position (left occipito-anterior).

Mechanism in Left Occipito-anterior Position.—As the head descends under the influence of the uterine contractions, it becomes more flexed than it was to start with. **Flexion** is due to several causes.

1. In the first moments of descent, while the head is being pushed down by the action of the uterine contractions on the liquor amnii remaining in the

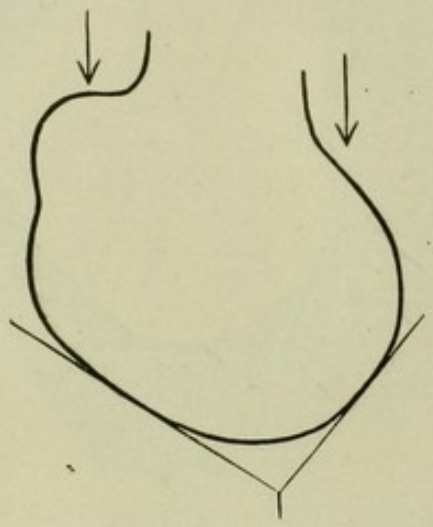

Fig. 148.—Differing inclinations of anterior and posterior planes of head.

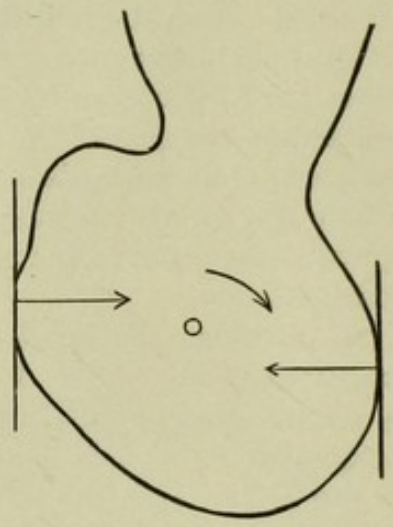

Fig. 149.—Effect of inward pressure of walls of birth-canal on moderately flexed head.

uterus after rupture of the membranes (p. 103), the pressure acts on the whole base of the skull, and flexion will be caused by the different angle at which the anterior and posterior slopes of the vertex meet the resistance of the walls of the passage to be dilated. It will be seen by the diagram that the resistance acts on the anterior slope of the vertex more nearly at a right angle than on the posterior slope, and therefore more powerfully. In other words, friction at this surface will be much greater, and this end of the head will be more impeded in its descent than the posterior end, which thus descends in front of it (fig. 148).[1]

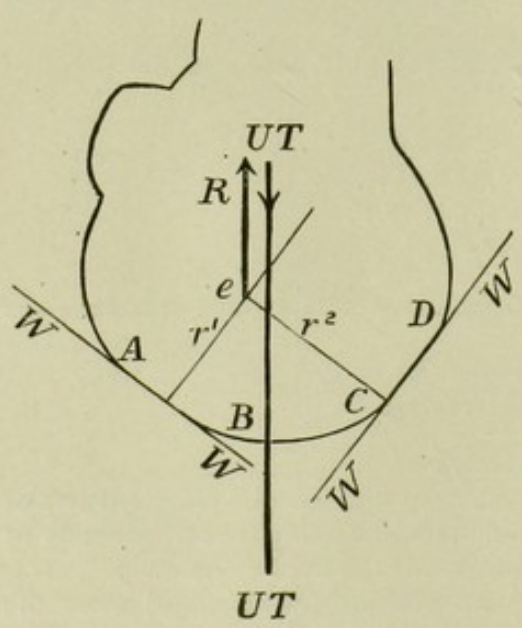

Fig 150.

[1] The mechanics of this are (fig. 150): *W W* are the walls of the parturient canal. *U T* is the line of the general intra-uterine pressure acting on the head, in the axis of the part of the canal occupied by the head. *A B*, *C D* represent the surfaces of the vertex at the anterior and posterior ends of the head respectively, acted on by the walls, *W W*. The lines r^1 and r^2 are drawn at right angles to these surfaces, starting from points on them equidistant from the axis of the canal; r^1 and r^2 meet at *e*, and their resultant is *R*, which must—since the head must move in the axis of the canal—be parallel to *U T*. It is now seen that *U T* and *R* form a couple, which will cause the forehead to be detained until the line *R* coincides with *U T*.

2. This cause is reinforced by the tendency any ovoid body has, in passing through an elastic tube, to place its long axis in coincidence with that of the tube. A couple is produced as long as this result is delayed, as is seen in the diagram (fig. 149).

3. Another reason for flexion in the case where the occiput lies to the left is the obliquity of the uterus. The uterus is usually inclined to the right, so that the axis runs downwards from right to left. It will be readily seen by the diagram that this state of things will tend to cause the head so to rotate on a horizontal axis at right angles to the plane of the paper that the occiput descends.

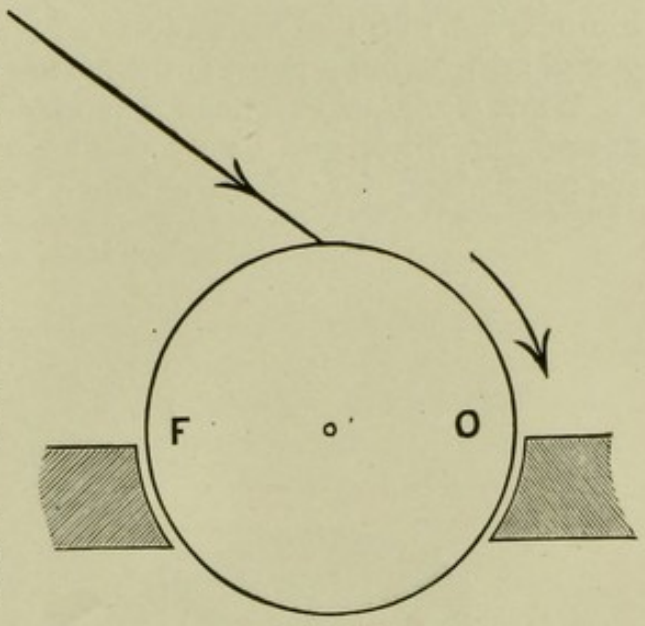

Fig. 151.—Effect of obliquity of uterine axis on head at brim. *O*, occipital; *F*, frontal end.

All these causes of flexion begin to act before the fundus comes into contact with the breech, and the form-restitution-force, or fœtal-axis-pressure (p. 103), comes into play.

4. When this happens, there is another cause of flexion produced. In the case of a somewhat flexed head, the force transmitted through the vertebral column acts on the head along a line running nearer the occipital than the frontal end of the head (fig. 152). If the head, represented by its occipito-frontal diameter, be considered as a lever, it will be understood that the longer arm (frontal) is more acted on by

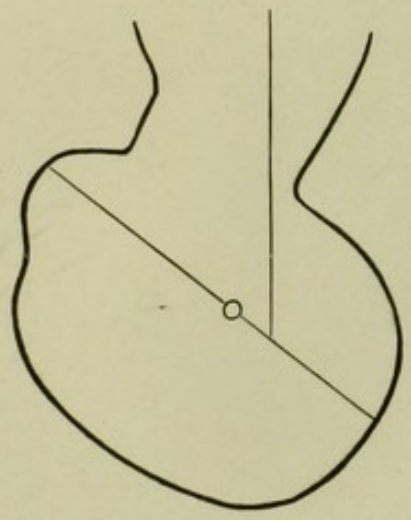

Fig. 152.—Fœtal axis-pressure on slightly flexed head.

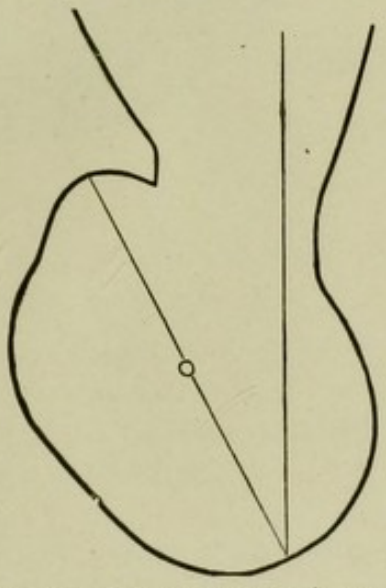

Fig. 153.—Effect of fœtal axis-pressure, fully flexed head.

the resistance of the walls of the canal at the girdle of contact than the shorter (occipital) arm, and the occiput is allowed to descend faster, producing flexion, and maintaining it (fig. 153).[1]

[1] This inclination of the head to the horizontal, produced by flexion, is known as Roederer's Obliquity.

The effect of flexion is to lower the posterior fontanelle, and to bring it within easier reach of the examining finger than the anterior fontanelle (see fig. 154). When the head has descended to the pelvic floor, the attitude of flexion causes the occipital end of the head to be the first part which comes into relation with that resistance. This fact will be immediately seen to be one of integral importance in the further movements of the head.

When a vaginal examination is made after the bi-parietal diameter has passed the brim, and before the head has come under the influence of the pelvic floor, the examining finger, which enters in the axis of the outlet,

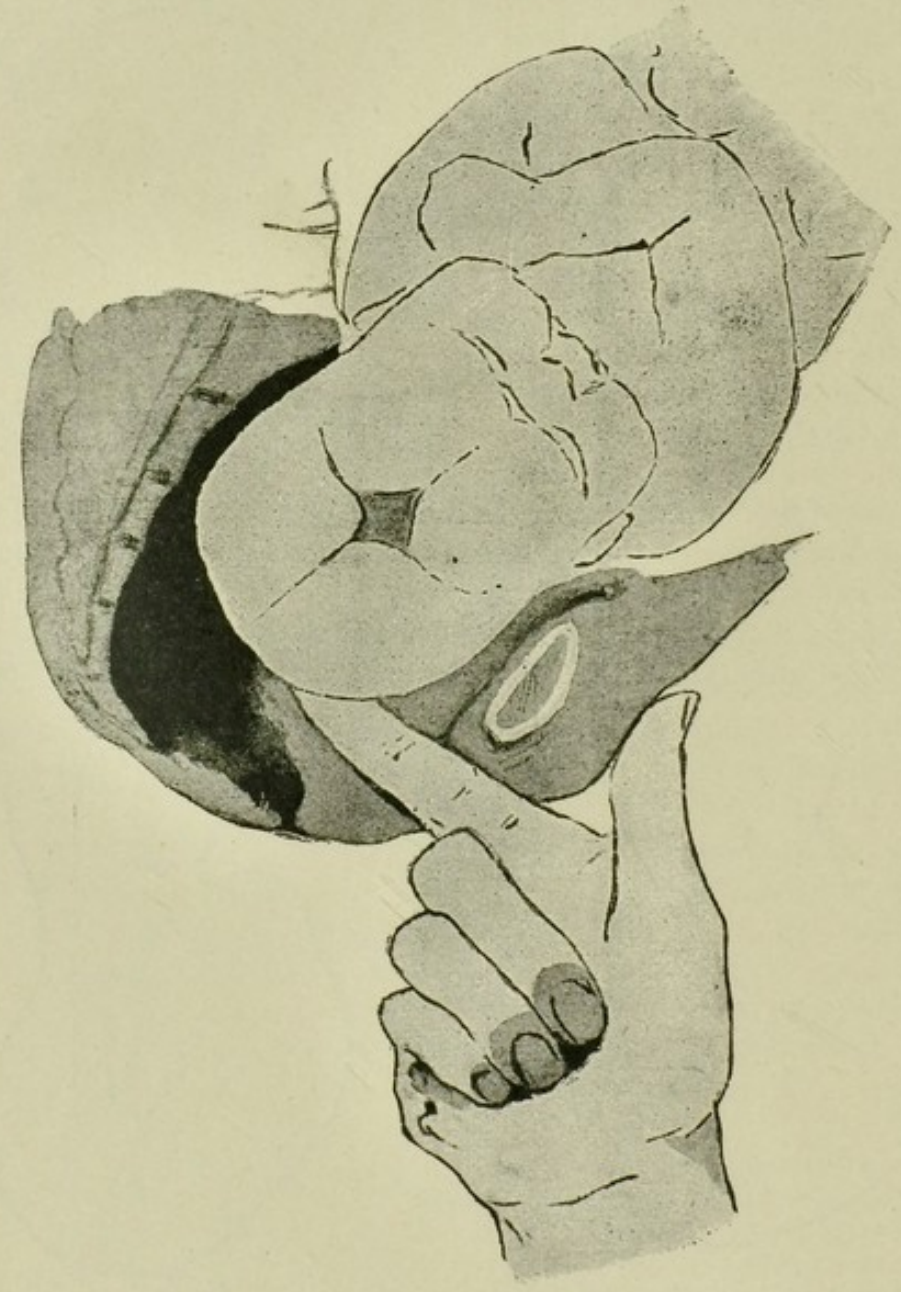

Fig. 154.—Relation of head to finger when occiput lies to the left.

touches one of the parietal bones first (in the position of the head now being considered, the right parietal bone), and not a point in the line of the sagittal suture. This suture lies nearer to the posterior wall of the pelvis than to the anterior ; in fact, it seems to be lying close to the sacrum. The reason for this is easily seen in the diagram (fig. 154). This obliquity of the

horizontal plane of the head with reference to the planes of the cavity, together with the situation of the caput succedaneum on the right parietal bone, gave Naegele the impression that the head passed the *brim* with the sagittal suture nearer to the promontory than to the pubes, and therefore with the relative obliquity just alluded to. He described this obliquity as existing at the brim, and as being a normal movement of the head in labour. It has been called *Naegele's obliquity* since his description. Another name for the want of coincidence between the horizontal plane of the head and that of the brim is Asynclitism. Asynclitism, or Naegele's obliquity, occurs in the case of passage of the head through the brim in a particular kind of deformed pelvis (see p. 433), but not in normal labour.

Internal Rotation.—As descent goes on, the head, with an inclination towards the right oblique diameter to start with, comes to lie, owing to the shape of the pelvis, quite in the right oblique diameter of the cavity, the occiput therefore coming more forwards. This movement in a plane at right angles to the axis of the pelvis at this part, and like that of a screw as

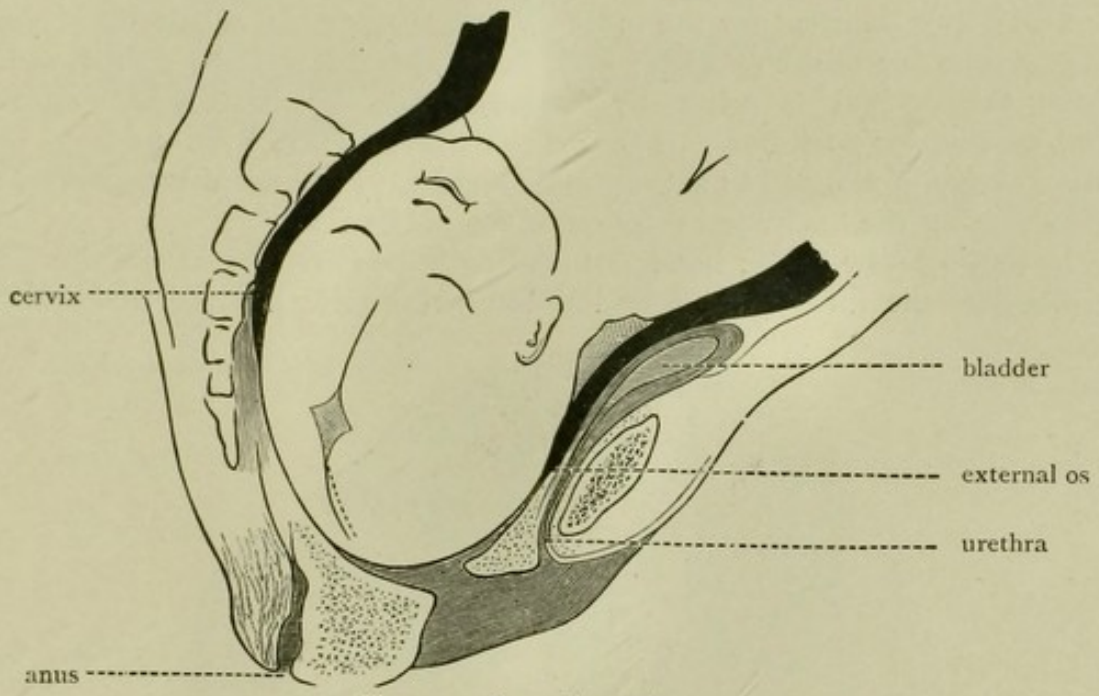

Fig. 155.—Internal rotation.

it enters a piece of wood, is called rotation. It is mainly a rotation of the head on the shoulders, but the shoulders are carried round with the head to a small and variable extent. To distinguish it from another rotation which takes place after the head has passed the vulva, the movement at this stage is named *Internal Rotation.*

When this movement has been begun by the tendency of the long axis [1] of the head to coincide with the longest diameter of the pelvic plane occupied, it is, when the occiput encounters the oblique resistance of that side of the pelvic floor, on which it impinges, carried further, so that the long axis of the head at the end of the rotation lies almost in the antero-posterior diameter of the pelvic outlet, with the occiput directed under the pubic arch. The head has rotated through nearly a quarter of a circle. In this particular

[1] In this plane.

mechanism (occipito-anterior) the pelvic floor continues the movement already begun by the shape of the bony pelvis (fig. 156).

The shape of the bony tube and that of the sloping floor do not, however, under all circumstances tend to rotate the head in the same direction as one another ; for, supposing the occiput at the brim to be slightly behind the end of the transverse diameter, in the fourth position, the shape of the pelvis would rotate it, as descent went on, into the nearest oblique diameter of the cavity—namely, into the left oblique ; and supposing the influence of the bony canal, owing to the very close fit of the head, continued to rotate the head in the same direction, the occiput would, at the end of rotation, look backwards instead of forwards (see fig. 170).

Owing to flexion, however, the fit of the head and the bony canal in the cavity is not an absolutely tight one ; for the longest diameter of the head in this plane is now not the occipito-frontal, but the sub-occipito-frontal, or one near it, measuring about 4 in. This diameter being in the left oblique is able to rotate, if caused to do so by the pelvic floor, across the transverse diameter of the cavity (4½ in.), and to gain the right oblique.

The pelvic floor is thus the most important agent in causing the normal anterior rotation of the occiput ; and, as we see, it is able to do this in cases where the occiput is originally inclined to go backwards, as well as in occipito-anterior positions. It thus differs in its action from the bony canal, whose shape, if allowed to act on unfavourable positions of the vertex, ends by increasing the backward rotation of the occiput.

Returning now to the head descending in the first vertex position. The resultant of the force (uterus and abdominal muscles) acting downwards in

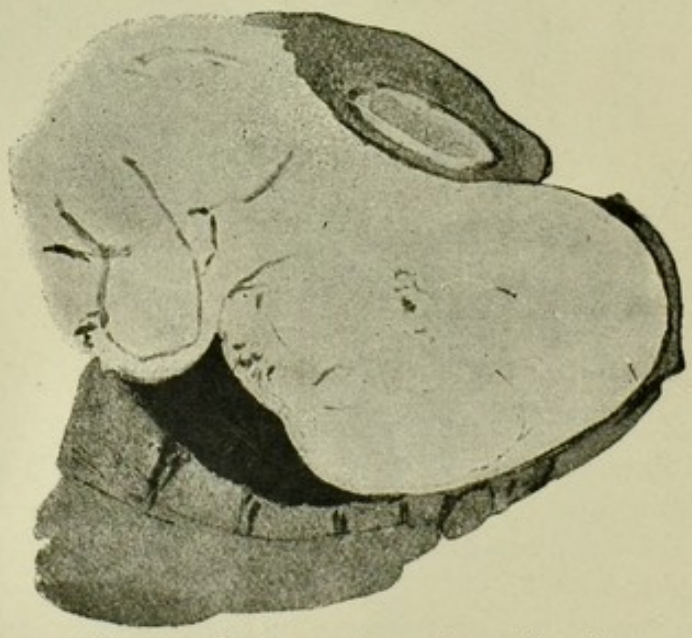

Fig. 156.—Occiput passing under pubic arch.

the pelvic brim axis and the forces acting forwards and upwards (pelvic floor) is one which is mainly forwards. The head moves bodily forwards in obedience to this, the vertex gliding along the gutter formed by the converging halves of the pelvic floor. By means of this movement, which is part of descent, though with the direction somewhat changed, the occiput is pushed under the pubic arch, and separates the edges of the vulva to some degree (fig. 156).

Extension.—Since the nape of the neck is firmly applied to the back of the symphysis, the centre of the head can only obey the general forward pressure just mentioned by means of the chin leaving the chest and extension of the head occurring (fig. 157).

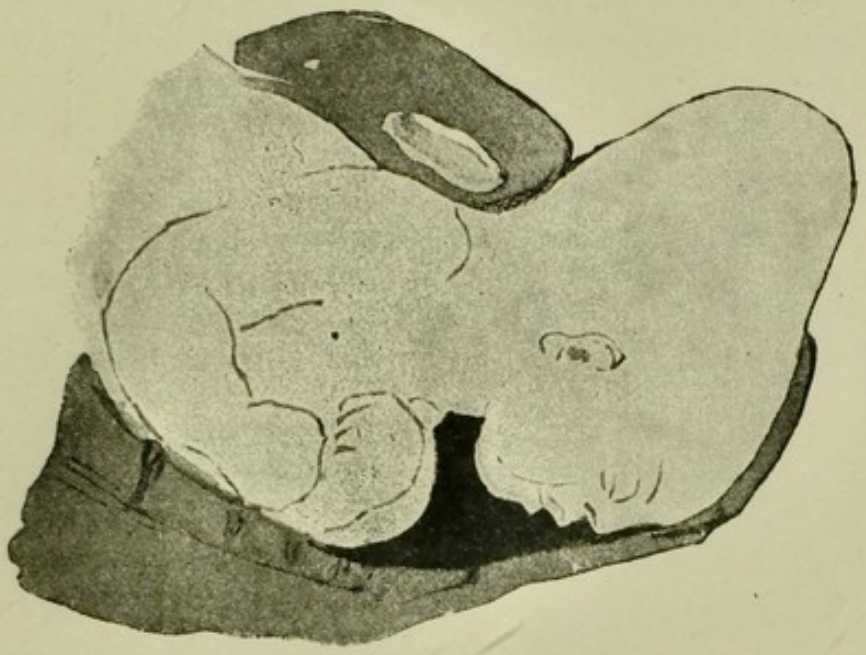

Fig. 157.—Process of extension. The separation of the chin from the chest is exaggerated.

This forward movement of the head has been just described as if it happened only after the occiput had rotated to the front as completely as it will do while in the maternal passages. As a matter of fact, however, the head is pushed forward by the pelvic floor before complete rotation of the

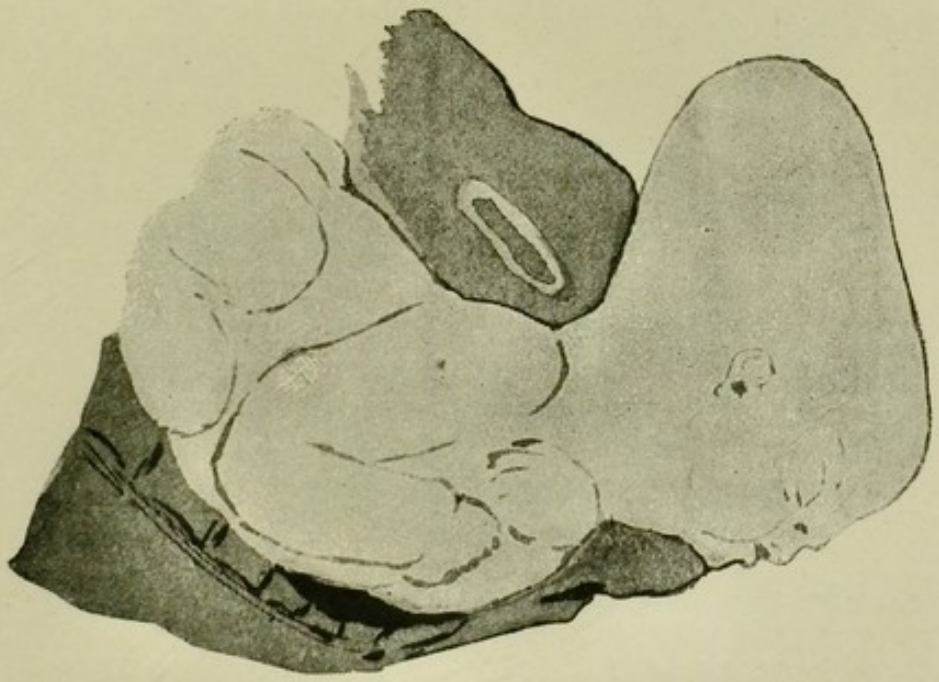

Fig. 158.—Continuation of extension : birth of head.

occiput has occurred, and while the right parietal bone is still looking to the front. The consequence of this is that some lateral flexion of the head toward the child's right shoulder takes place.

It is when rotation is complete that extension of the head occurs. The vertex being, now that the neck is fixed, the most movable part of the head, revolves round the point of fixation—namely, the lower edge of the symphysis; and the vertex, anterior fontanelle, forehead, nose and chin, successively glide over the perinæum and the head is born. On account of the extension, the occiput moves upwards and forwards in front of the symphysis, so that on the emergence of the head the face is looking backwards and downwards in reference to the mother (if she were standing upright) (figs. 157 and 158).

Rotation of the Shoulders.—During the passage of the head through the cavity of the pelvis, the shoulders become engaged in the brim. Their long diameter (bis-acromial) is at right angles to the long diameter of the head, and they consequently come down in the pelvic diameter at right angles to that in which the head descends. In the first position, therefore,

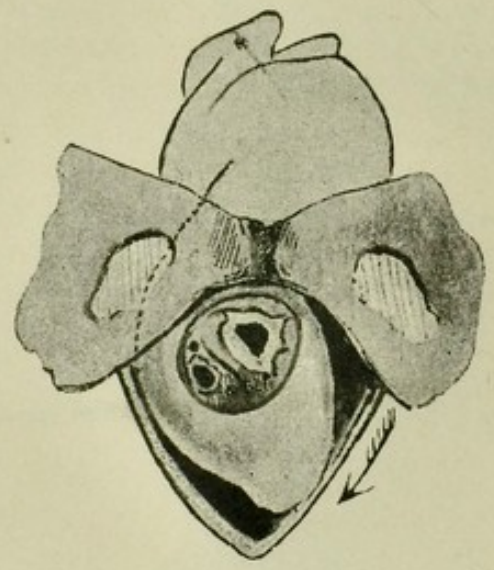

Fig. 159.—External rotation. The head is removed and the direction of rotation of the shoulders is shown by the arrow.

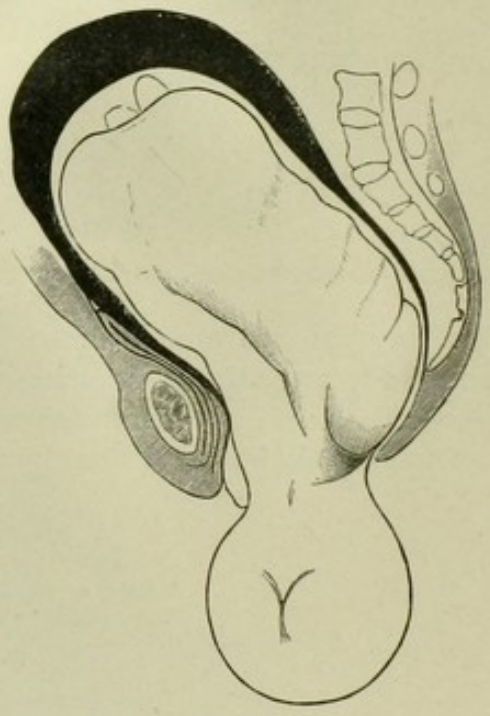

Fig. 160.—Relations of child to pelvis during delivery of shoulders. (From Winckel's frozen section.)

they come down in the *left oblique*, with the right shoulder in front and close to the right foramen ovale. As they continue to descend they rotate so that their bis-acromial diameter approximates to the antero-posterior, the posterior shoulder gliding to the bottom of the gutter of the pelvic floor (figs. 159 and 160). When the head is born they come into the antero-posterior diameter (fig. 161).

Restitution; External Rotation.—Directly the head is born and free to move as it pleases, it recovers its usual relation to the shoulders—namely, one with its long diameter, occipito-mental, at right angles to the bis-acromial, which last is nearly in the antero-posterior. It does this immediately the chin clears the vulva, as a rule with almost a jerk.

Then, as the bis-acromial diameter turns completely into the antero-posterior at the outlet of the vagina, the right shoulder being in front, the

head retains its relation to the shoulders and rotates too, thus turning completely facing to the right (fig. 161). The occiput is therefore to the left, the position of the head becoming the same as that in which it entered the pelvis ; and hence the name of restitution. The direction of this rotation is the opposite of that of internal rotation.

External rotation occurs in all mechanisms in which the head is born first and it is only necessary to remember that the *back* of the fœtus always

Fig. 161.—Mechanism of labour in first vertex.

looks to the same side of the mother at the end of this rotation as it did when the head entered the pelvis at the beginning of labour. There will then be no difficulty in describing the external rotation proper to the particular mechanism under consideration ; this rule holds good whether the presentation be vertex with the occiput anterior or posterior, or whether it be a face or a brow presentation.

Delivery of the Shoulders.—The shoulders are delivered both together in the antero-posterior diameter of the vulvar aperture.

While they are passing through the lower end of the birth-canal, they lie with the bis-acromial diameter in coincidence with the plane of the outlet, whereas the pelvic end of the child's trunk is passing the brim with the bis-iliac diameter in the plane of the brim. There is, in consequence, a lateral flexion of the trunk (see fig. 160), which is most accentuated just as the shoulders escape ; for the anterior shoulder, in somewhat the same manner as the nape of the neck in the delivery of the head, is made for a moment the centre of rotation round which the posterior shoulder revolves.

The *arms* are usually arranged with the hands up under the chin, and in this attitude have no influence on the mechanism.

The *hips* have undergone the same rotation as the shoulders and in the same diameters of the pelvis if the head has been all along in the first position. They emerge with the bis-iliac diameter in the antero-posterior of the pelvis.[1]

[1] If the head began in the fourth position (see p. 143), the shoulders will have rotated into the left oblique before the hips engage, and the latter will not need to rotate across the antero-posterior as the former have done during the long rotation of the head occurring in the mechanism of a fourth vertex.

Moulding of the Head

It will be noticed that the right parietal bone has been the anterior one during the whole process of expulsion. It is anterior at the beginning when the head is in the transverse or nearly so; it is anterior in the cavity when the occipito-frontal diameter is in the oblique (right or left oblique according as the head is in the first or fourth position); it is so at the outlet when the head does not completely rotate into the antero-posterior.

It is thus less pressed upon than the left parietal bone (see fig. 155), and therefore tends to become more convex.

The left parietal bone, on the contrary, is exposed to pressure throughout the second stage of labour, and is so especially when the head has reached the pelvic floor, since it is on the posterior aspect of the skull that the pelvic floor then presses. In consequence the left bone, especially in its anterior part, becomes flattened.

The head thus may, if the resistances to its onward passage are at all considerable, become much distorted.

In addition to this change of shape, the head is compressed along certain of its diameters in its journey through the birth-canal, and the diameters at right angles to these are in a more or less corresponding degree lengthened. In the brim and cavity the pressure compresses the circumference corresponding to the sub-occipito-frontal and sub-occipito-bregmatic diameters; and at the outlet of the vagina the same diameters are still compressed together with a series of circumferences of imaginary planes on a common axis, the mento-vertical. The bi-parietal is a diameter of one of the circumferences thus reduced, and the bosses at the ends of this diameter are flattened.

The head is by this pressure shortened as to its short diameters, and lengthened in its long ones (mento-vertical, mento-occipital) (see figs. 156, 157, and 158).

The shape which the head assumes in each mode of delivery will be described in the account given of the mechanism of each.

Summary of Movements of Head

Summarising the movements of the head, we find—

The centre of the head ADVANCES in the axis of the parturient canal throughout.

ROTATION is going on throughout; in the canal (internal rotation) in one direction, outside the pelvis (external rotation or restitution) in the opposite.

FLEXION exists from the beginning of the second stage of labour to the moment at which the nape of the neck hitches under the pubic arch.

EXTENSION then ensues and persists until the head is born.

The following table may help the student to remember the relations of the movements. Those movements placed on the same line take place at the same time.

Advance . . .	Rotation . . .	Flexion
Advance . . .	Rotation . . .	Extension
Advance . . .	Rotation (reversed)	

CHAPTER XVII

SPECIAL MECHANISM OF LABOUR IN VERTEX POSITIONS

First Vertex.—The long diameter of the head (occipito-frontal) is in the right oblique diameter of the pelvis, with the occiput anterior.[1] The back of the fœtus is to the left, the limbs to the right of the mother's abdomen, and the fœtal heart is heard best to the left of, and below the navel, on the side opposite to that on which the limbs are felt.

Per vaginam, if the os is sufficiently dilated the sagittal suture may be felt, running, the woman being in the usual left lateral position, downwards

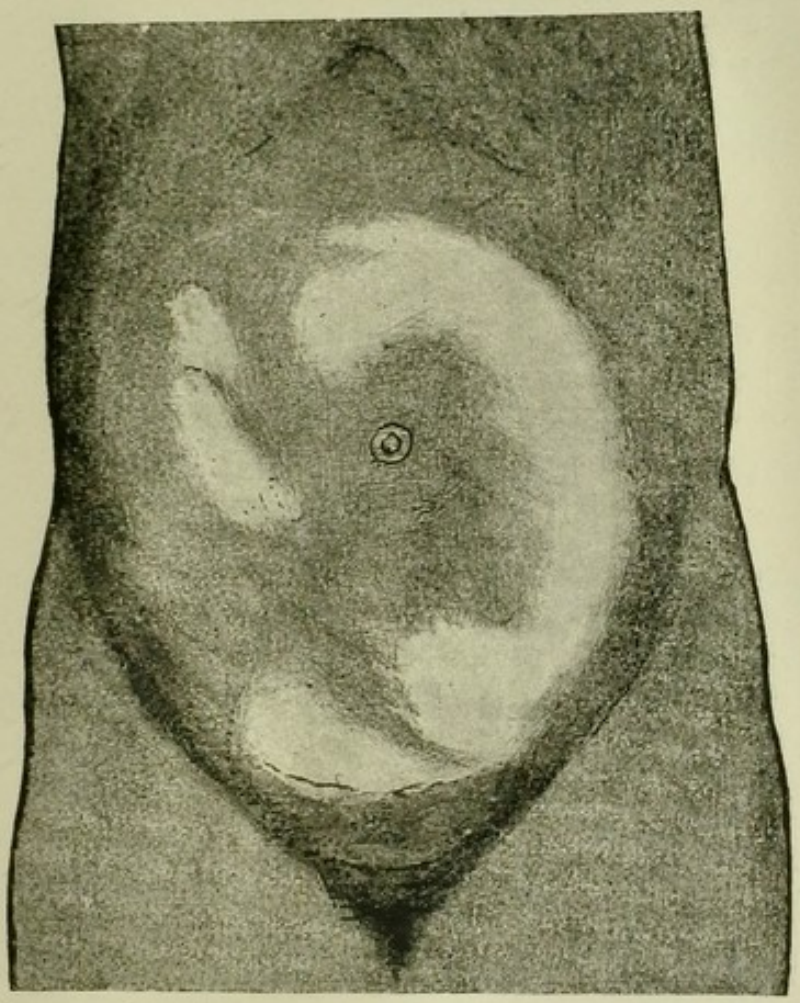

Fig. 162.—Graphic representation of parts felt on abdominal palpation in the case of cephalic lie. (1st vertex position.)

and forwards, and ending anteriorly in the tri-radiate posterior fontanelle ; with further dilatation of the os than is necessary for the last observation, the anterior fontanelle may be felt (fig. 163) ; and later, the right ear, if sought, with

[1] It will be remembered here, and in other positions of the head, that the long diameter is not in the actual oblique at the brim, but in the transverse, with an inclination to one or other oblique.

the pinna directed downwards and forwards, will be a guide to the position. At this stage the posterior fontanelle will have descended so as to form part of the presenting area, and the anterior one will have turned upwards out of reach owing to flexion of the head. The right parietal bone is anterior (see also figs. 129 and 130).

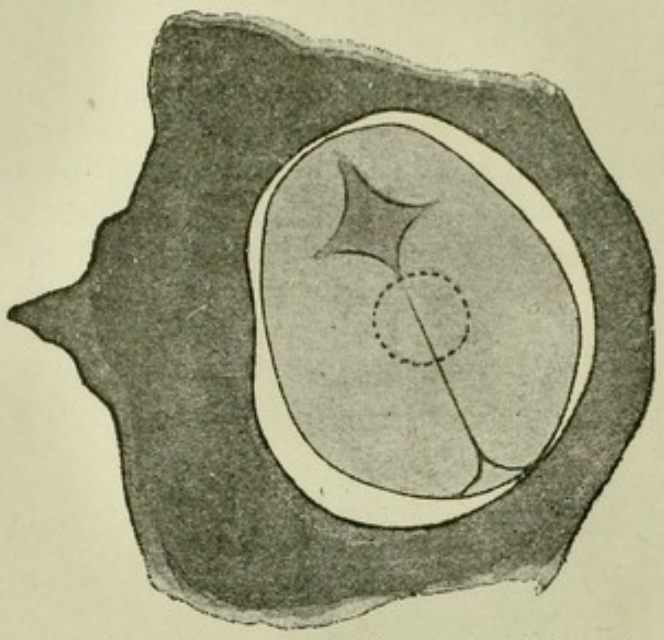

Fig. 163.—First vertex. Pelvis of woman lying on her left side, seen from below. The dotted ring indicates the position of the os before much flexion has taken place.

Beginning at the brim, the head passes this flexed, and reaches the cavity with its flexion increased. It there rotates completely into the right oblique, with the occiput close to the left foramen ovale. The occiput is then directed by the pelvic floor towards the middle line, and the sub-occipito-frontal diameter comes almost into the antero-posterior diameter of the outlet. The head is delivered by extension. The shoulders descend in the left oblique, the right shoulder being to the front, the back of the child to the left, as at the beginning.

When the head is free the face turns towards the mother's right thigh, and the occiput towards the left at once ; and on the shoulders rotating into the antero-posterior, the external rotation is completed by the occipito-frontal diameter coming to lie squarely right and left, the occiput being to the left as at the brim.

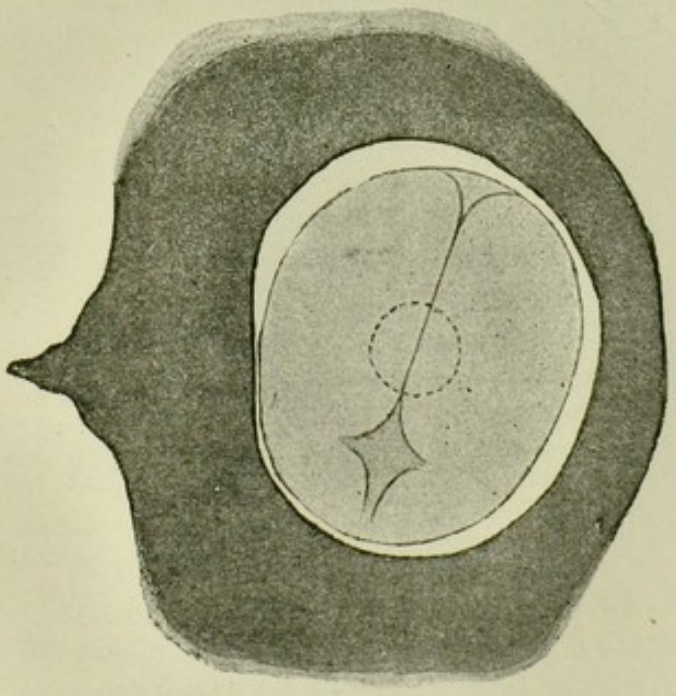

Fig. 164 —Second vertex. Pelvis as in last figure.

Second Vertex.—The long diameter lies in the left oblique diameter, with the occiput anterior.

The back of the fœtus is to the mother's right, the limbs to the left. The fœtal heart is to the right of the middle line, away from the limbs.

Per vaginam, the sagittal suture runs upwards and forwards. The left parietal bone is anterior, and, substituting left for right, the process of labour is identical with that which takes place when the head engages in the first position. The occiput on birth of the head turns to the mother's right thigh.

Third Vertex.—The long diameter of the head lies in the right oblique with the occiput posterior.

The back of the fœtus is to the right, the limbs to the left. The fœtal heart is heard to the right of the middle line.

The sagittal suture runs downwards and forwards (as in the first position), but the posterior fontanelle is found at the posterior (with reference to the mother) end of the suture. The left parietal bone is anterior (the back being to the right).

The head descends well flexed, and as the occiput reaches the pelvic floor, it is directed forwards under the pubic arch, rotating through three-eighths of a circle.

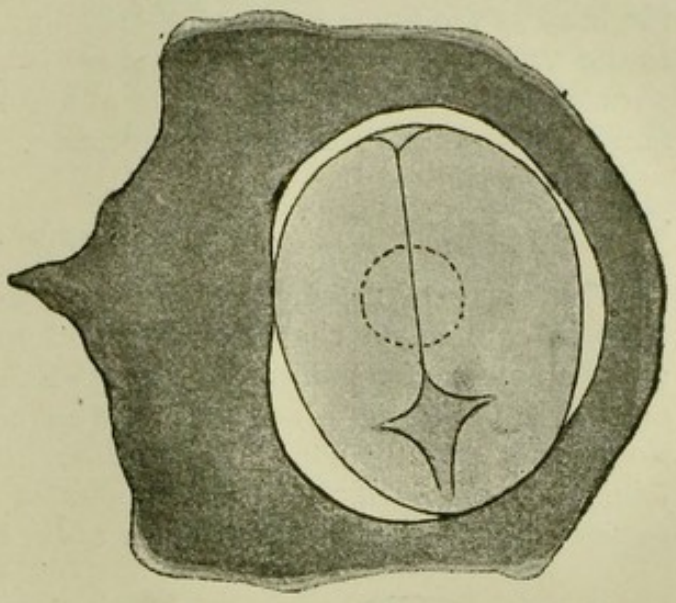

Fig. 165.—Third vertex. Pelvis as in last figure.

The shoulders are at first in the left oblique, the left shoulder forwards. As the occiput comes to the front the shoulders rotate into the antero-posterior and then beyond this into the right oblique.

The third position has now been converted (or 'reduced') into a position identical with that which an originally second vertex would have at this stage of advance, and the mechanism becomes now that of a second vertex.

Fourth Vertex.—The long diameter is in the left oblique, with the occiput posterior. The back of the fœtus is to the left, the limbs to the right. The fœtal heart is heard on the left side.

The sagittal suture runs upwards and forwards, the small fontanelle being posterior. The right parietal bone is in front, as in first position. The head descends well flexed, and the occiput is rotated to the front. The head behaves from now to the end as if the position had been originally a first vertex, the shoulders having rotated so as to accommodate themselves to the new oblique diameter occupied by the head.

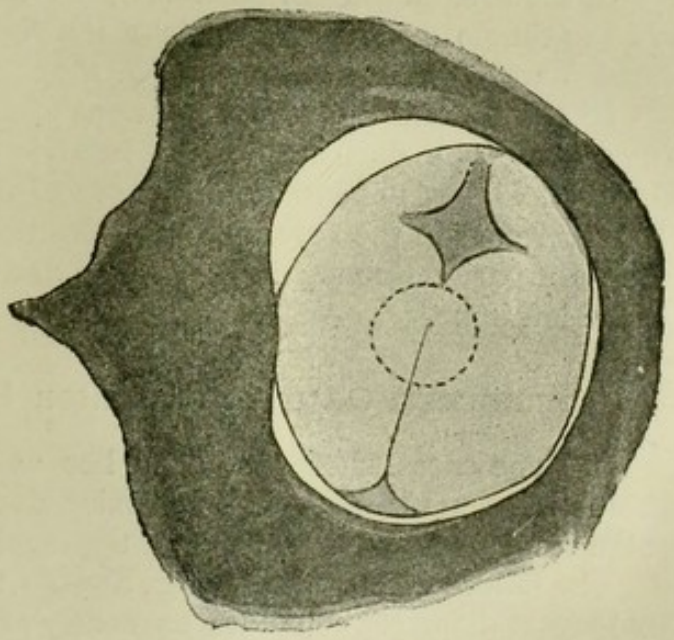

Fig. 166.—Fourth vertex. Pelvis as in last figure.

It will be noticed that the mechanism of the first and fourth positions are practically the same thing, as are those of the second and third. The only differ-

ence is that in the third and fourth the occiput impinges on the pelvic floor behind the transverse diameter, and consequently has a larger segment of a circle to rotate through than in the first and second, since in the two latter the impact takes place in front of the transverse. If the direction of the back of the fœtus be remembered—to the right in the second and third, to the left in the first and fourth—there is no difficulty in remembering which parietal bone or which shoulder is anterior in any case, or to which side the face turns in the movement of restitution.

Moulding of Head

This group of mechanisms ending with rotation of the occiput forwards have in common a characteristic head moulding. As already mentioned, the diameters of the head compressed throughout are mainly the smaller ones—viz. suboccipito-bregmatic and suboccipito-frontal, the occipito-frontal being only slightly compressed. The head therefore elongates in a line joining the chin, which is the last point of the advancing head-ovoid, to the vertex (slightly to one side or other of the middle line).

Fig. 167.—Moulding in first vertex position (right occipito-anterior).

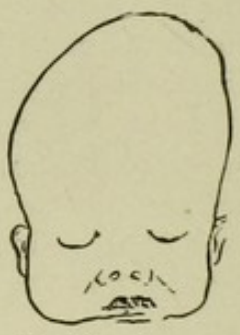

Fig. 168.—Moulding in second position of vertex (left occipito-anterior).

In the first and fourth positions the elongation is along a line joining the chin to the posterior upper angle of the right parietal bone, and produces a head shaped as in the diagram (fig. 167).

In the second and third positions the head is correspondingly altered (fig. 168). The deformity of the head is accentuated by the caput succedaneum, which is situated on the apex of the asymmetrically conical vertex. It is therefore in the first and fourth positions on the posterior upper angle of the right parietal bone ; in the second and third on the corresponding angle of the left bone.

Unreduced Occipito-posterior Positions of the Vertex

In some cases where the head lies at the brim in the third or fourth position, the usual movement of flexion does not happen, or is deficient, and there results some modification of the mechanism of these positions.

The failure of the head to flex and so to get into such an attitude that its longest diameter coincides as nearly as possible with the pelvic axis at the level to which the head has reached, is caused in some cases by a lesser degree of action of those forces (slight contraction of the conjugate, tilting of the uterus to the side towards which the back of the child lies ; see p. 154),

which, when they act more fully, produce face and brow presentations. These presentations will be described in their place.

Spiegelberg says that the head passes out with the occiput directed backwards when there is not sufficient resistance to cause it to be strongly flexed ; and that birth in the third and fourth positions occurs chiefly with small heads and large pelves. If the causes of flexion as described on p. 132 be accepted, it is obvious that an abnormally large pelvis can have no effect in diminishing flexion, because this movement is brought about by the reaction of the soft parts alone.

The convexity of the promontory and lumbar spine will tend to cause extension when the child's occiput is backwards at the brim (fig. 169).

Herman [1] points out that in a normal pelvis, if the occiput is directed backwards, lying in one or the other oblique, the bi-parietal diameter of the skull lies in the sacro-cotyloid diameter (or one near it) of the pelvis. If, on the other hand, the occiput is directed forwards, the bi-parietal lies in the full length of the oblique (compare figs. 163 and 164 with figs. 165 and 166). The bi-parietal is thus, if the occiput is backwards, somewhat more retarded by friction than when the occiput is forwards.

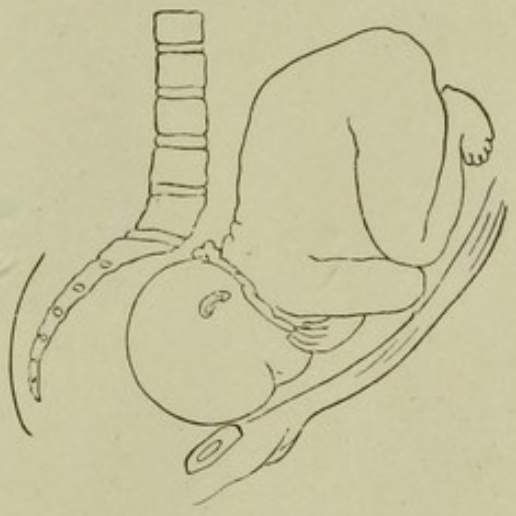

Fig. 169.—Convexity of promontory, causing extension. (After Pinard and Varnier's photograph of a frozen section.)

Flexion is by this means interfered with, and (1) *the occipital end of the head does not reach the pelvic floor much, if any, sooner than the frontal end.* It is therefore not directed forwards under the pubic arch as it is in the normal mechanism of vertex presentations. The absence of flexion also (2) *causes the occipito-frontal diameter of the head to lie across the pelvis, instead of the suboccipito-frontal*, which should by the time the head has reached the cavity have replaced the longer diameter. These 4½ in. (occipito-frontal) lie in a 5-in. diameter of the cavity—namely, the oblique ; but to rotate into the oblique at right angles to the one it now occupies (as would happen if the head were flexed) it would have to occupy the transverse for a moment. The transverse diameter of the cavity is 4½ in., even in the dried pelvis, and so when the soft parts are present the fit is too tight to be possible. As the long axis of the head must, before it reaches the pelvic strait, be rotated into the antero-posterior diameter of the pelvis, the occiput turns into the nearest space—namely, the hollow of the sacrum.

The anterior fontanelle is now to be felt without difficulty. This fontanelle has been lower than usual all through, owing to the horizontal levelling of the head. Its presence in the presenting area should at once suggest the state of affairs.

Mechanism of Labour.—After rotation of the occiput backwards, the whole head is pressed against the pubic arch by the pelvic floor, and the

[1] *Difficult Labour*, p. 5.

forehead becomes fixed there for a short space of time (fig. 170). The head revolves round the forehead to a variable extent, producing flexion (fig. 171),

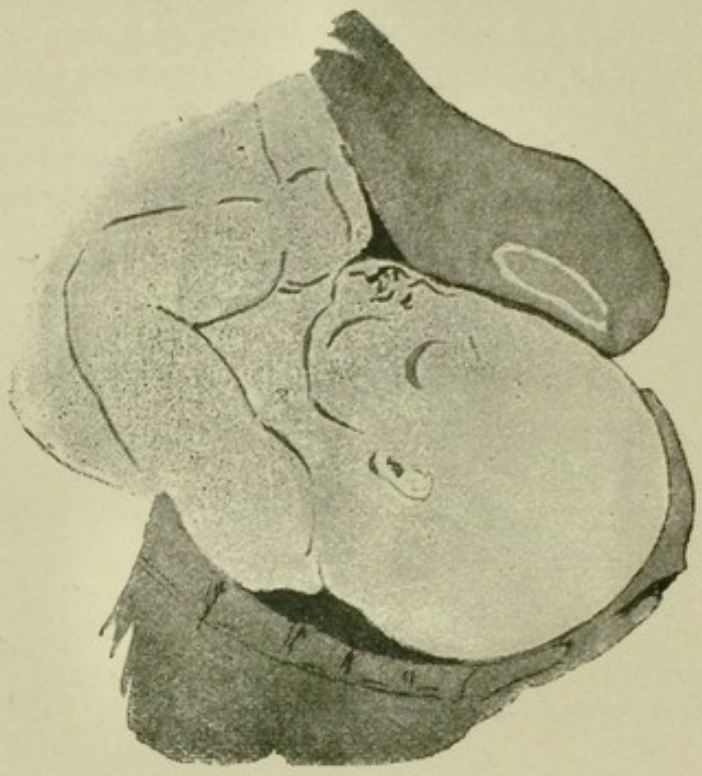

Fig. 170.—Persistent occipito-posterior.

a slight gliding movement upwards of the forehead behind the symphysis as a rule taking some share in the mechanism. The vertex is in this way finally

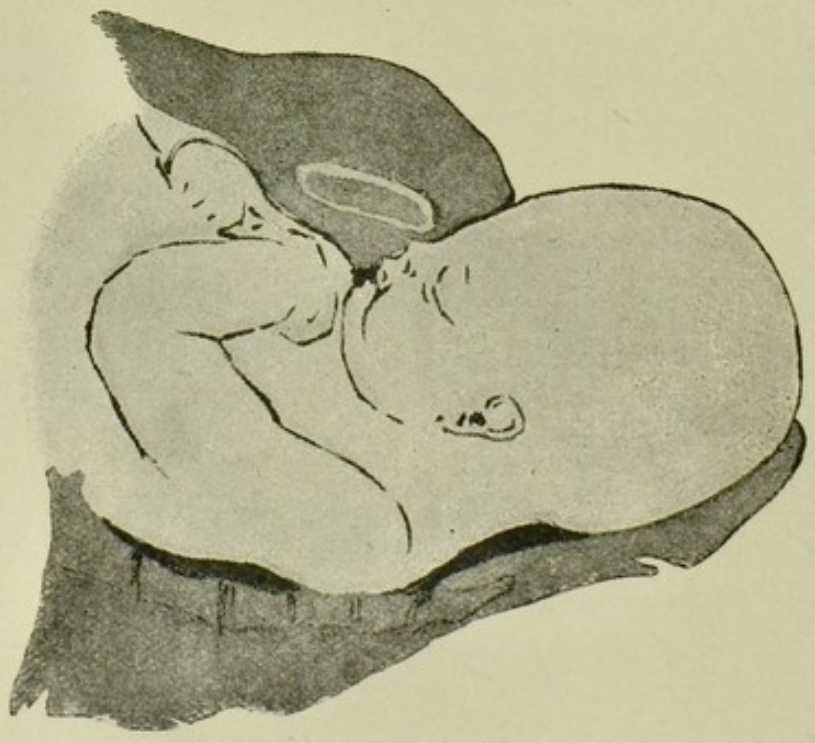

Fig. 171.—Persistent occipito-posterior.

brought most in advance, and, by further descent of the head, it and the occiput pass over the perinæum. Directly this happens, and the occipital

end of the head is free from the forward pressure of the pelvic floor, it moves back with almost a jerk over the inferior surface of the perinæum until the anterior border of the latter presses on the nape of the neck. The forehead,

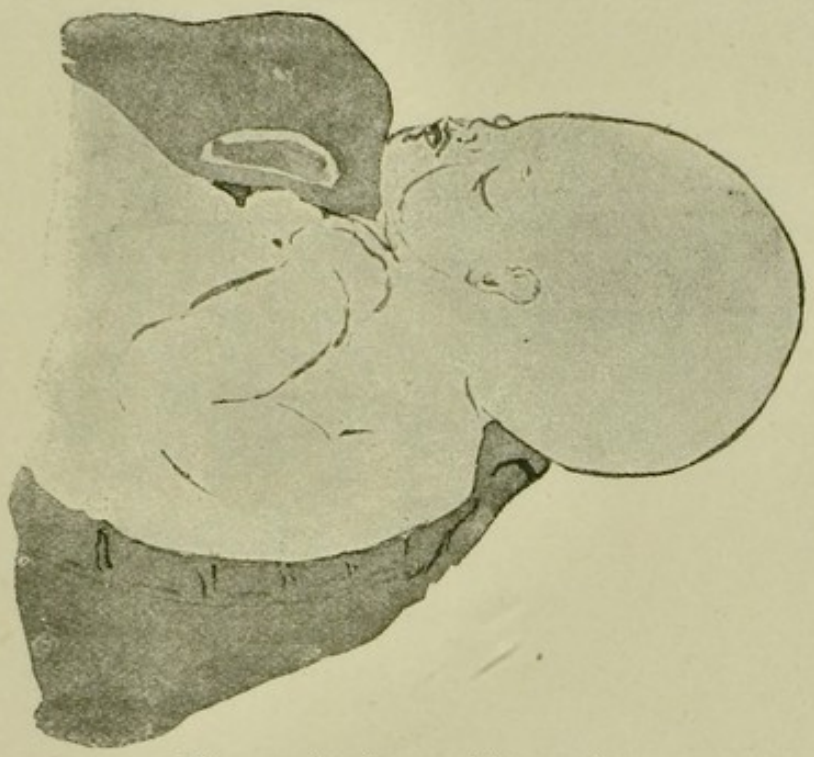

Fig. 172.—Persistent occipito-posterior.

face, and chin by extension now successively glide under the pubic arch (fig. 172). The shoulders behave as in the ordinary third position. To take an example : in the third position the shoulders are at first descending in the left oblique, and the back is to the right. The left shoulder is opposite the right foramen ovale. This shoulder rotates slightly backwards, almost into the transverse, as the occiput turns backwards ; but, when the head is free, this shoulder comes to the front again, and the face will look to the left thigh of the mother, as in a normally behaved third position ; in fact, the back of the child, as in all cases, looks to the same side of the mother throughout.

Another and a *less common method of delivery* in unreduced occipito-posterior cases is by exaggerated flexion occurring while the head is on the perinæum, or before it reaches the pelvic floor. The forehead must in the former case move up when it is behind the pubes, since flexion has been described as taking place at a late stage ; but in the latter case the forehead remains hitched on the upper edge of the symphysis, as shown in the diagram (fig. 173), which was made from a case in the writer's own practice. Here the head had remained fixed at the level of the cavity, but with the forehead high, and the supra-orbital ridge above the brim. The vertex had descended low into the pelvis, and was slightly distending the perinæum. Attempts at delivery with

Fig. 173.—Rarer form of mechanism in persistent occipito-posterior cases.

the forceps which had been made had not succeeded, because the blades slipped off the head each time traction was made, since they could be applied to the hinder end only. The forceps were effectually put on by pressing the forehead backwards through the abdominal wall above the pubes, and bringing the handles very far back so as to get the tips of the blades well on the bulk of the head.

Moulding of the Head

The alteration in shape which the head undergoes in passing through the pelvis with the occiput backwards is, in the first-described and *commoner mechanism*, almost in an opposite direction to the moulding in occipito-anterior positions. So, instead of finding the suboccipito-frontal diameter diminished and the mento-vertical increased, we have, in face to pubes cases, the suboccipito-frontal and suboccipito-bregmatic diameters increased, and the mento-vertical, if anything, diminished, as is seen in the diagram (fig. 171) showing the mechanism.

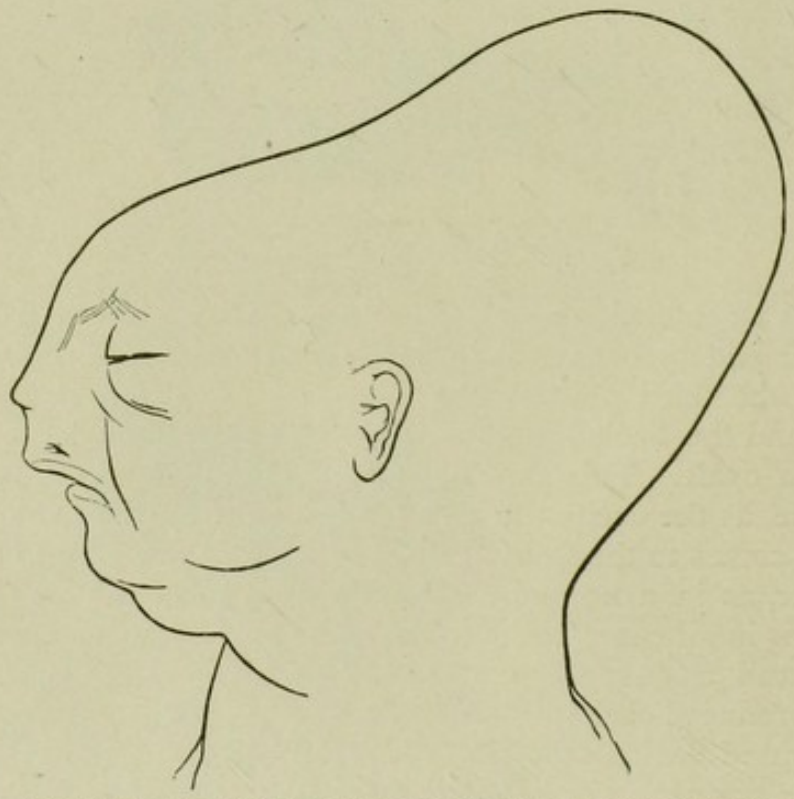

Fig 174.—Moulding of head in rarer form of persistent occipito-posterior mechanism. (Case of fig. 173.)

In the *rarer mechanism*, however, the head comes to resemble that of a very exaggerated occipito-anterior position. The way this is brought about will be readily seen from the diagram (fig. 173) representing one stage of the mechanism of labour, and the result is shown in the outlines of the head of the same child after delivery.

In both methods of delivery the perinæum runs more risk of laceration than is the case in occipito-anterior mechanisms, for the diameter distending the vulva in the latter is the suboccipito-frontal (4 in.), whereas in the face to pubes cases the full diameter of the head is represented by the fronto-occipital diameter of 4½ in. (fig. 171).

Asymmetry of he vault is not so marked in unreduced occipito-posterior cases as in those which end with the occiput forwards, because the fore part

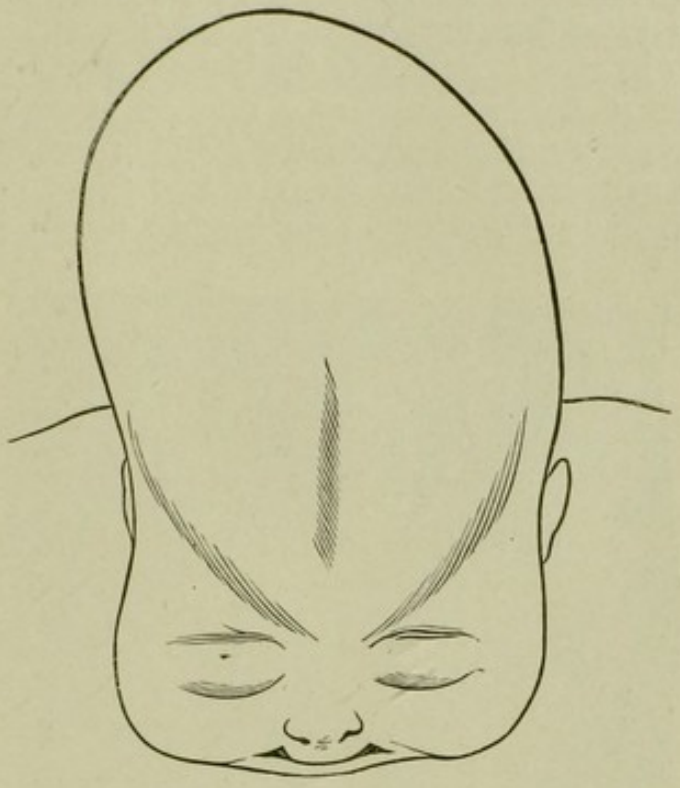

Fig. 175.—Moulding of head in same case as fig. 174 (seen from above).

of the vault, being partly formed by the frontal bones, is not so plastic as the rear. The presenting (anterior) side of the vertex is, however, in prolonged labours, rendered more convex than the posterior.

CHAPTER XVIII

DIAGNOSIS OF LIES AND POSITIONS

IT is of the utmost importance to ascertain exactly the relation of the fœtus to the maternal passage at the earliest possible moment of labour, so as to be able to render intelligent assistance if aid becomes necessary. To make quite certain of the relation, a routine method of examination must be adopted in each instance, and the following means of investigation are at our disposal :

Abdominal Examination.—(*a*) Inspection. (*b*) Palpation. (*c*) Auscultation.

Vaginal Examination.—(*a*) Before rupture of membranes. (*b*) After rupture.

We will here consider the question of abdominal examination especially : the results of vaginal examination are sufficiently detailed under the description of each position.

Abdominal Examination

The same arrangements should be made for inspecting and palpating the abdomen as those described under the heading of Diagnosis of Pregnancy, especially bearing in mind that the bladder must be empty.

The long axis of the fœtus can, as a rule, be easily made out, and in the group of cases now under consideration it will be more or less coincident with that of the mother. In all cases it will be found that the best time for observing the *general uterine contour* is when the organ is contracted ;

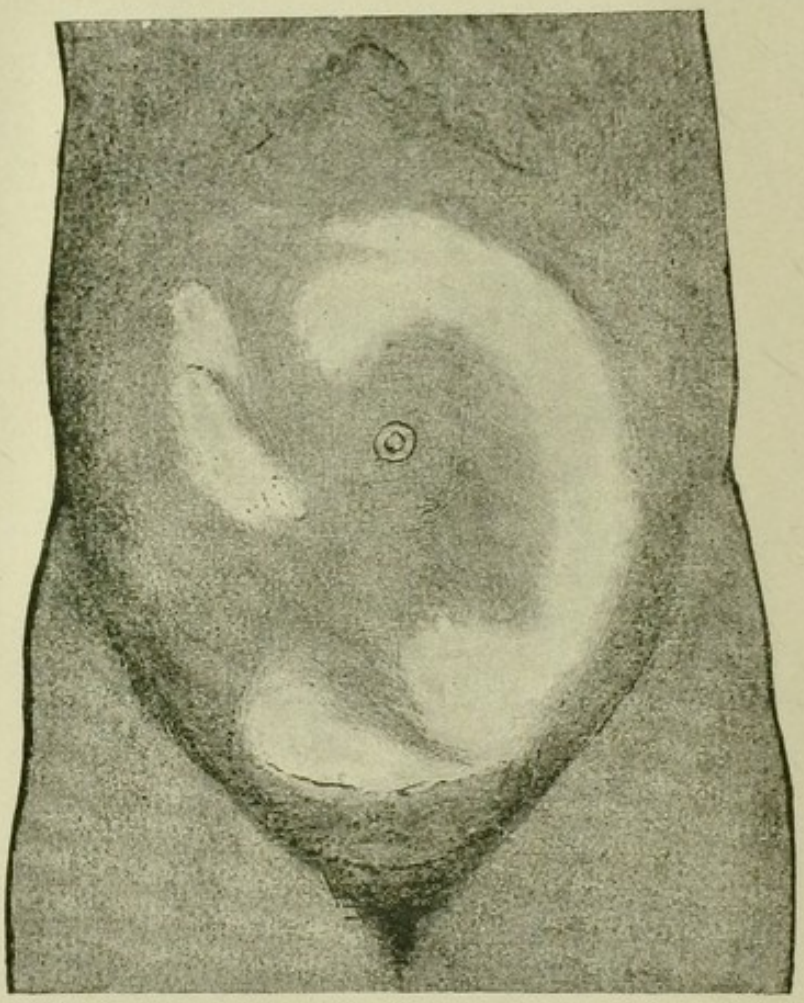

Fig. 176.—Graphic representation of parts felt on abdominal palpation in a case of cephalic lie.

while the *position of the fœtal parts*, both as regards lie and attitude, can only be ascertained during relaxation.

Deviations of the axis of the uterus, when present, can readily be seen and felt under favourable circumstances. These deviations, as will by this time be understood (see p. 133), are of some importance in the mechanism of labour, and the less favourable presentations may be improved by taking steps to diminish or change the side of any obliquity which may exist, before or during the engagement of the head. When the uterus is relaxed, the situation and attitude of the trunk and limbs of the child can with care be absolutely determined in the great majority of pregnant women.

To do this it is best to stand at the right side of the woman, so that the

observer's face looks towards her head. The hands should then be placed on the abdomen, the palms lying flat on the surface. The left hand will lie on the patient's right side, and the right hand on her left. The uterus and its contents can now be examined with a hand on each side, the one ready to make counter-pressure while the other explores the surface.

The limbs are the easiest parts to recognise, owing to their greater irregularity and their projection from the general mass ; and very often, where the fœtal movements are vigorous and the abdominal walls are thin, they may be seen at once. If in a longitudinal lie the limbs are felt or seen at the fundus when the presence or absence of the head there is as yet

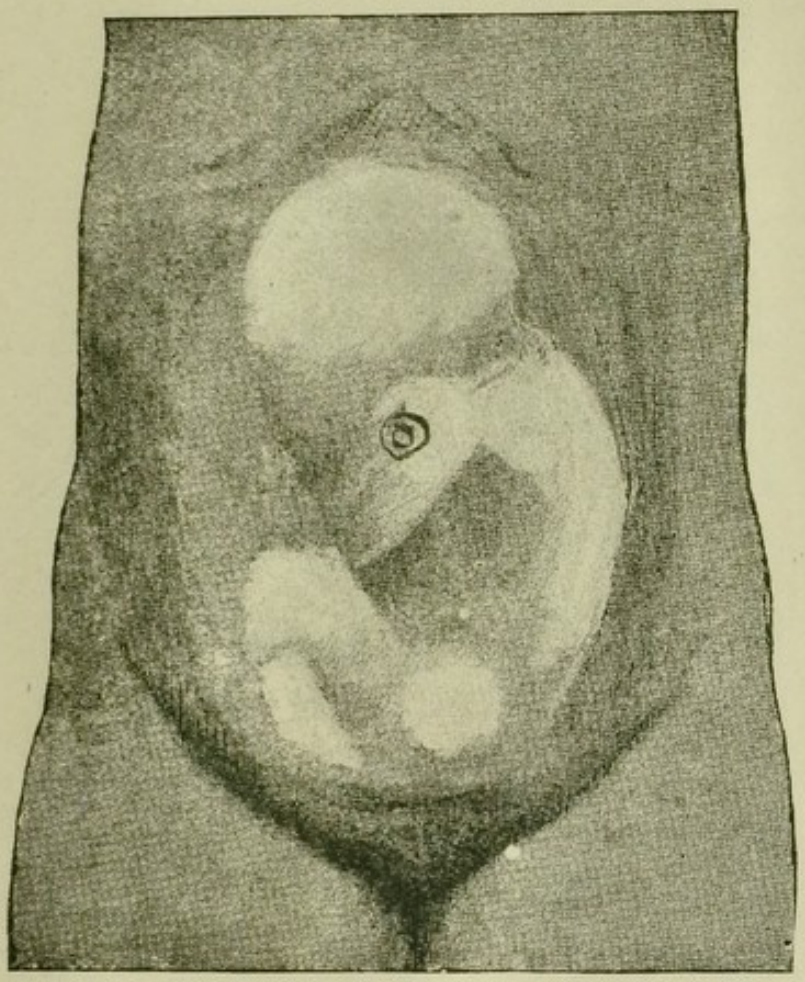

Fig. 177.—Graphic representation of parts felt on abdominal palpation in a case of podalic lie.

doubtful, it is thereby proved that the breech is uppermost, and that the fœtus is presenting by the head (fig. 176).

On the opposite side of the uterus to the limbs can be felt the broad, smooth surface of the back. This surface usually looks pretty squarely to one side or the other, and it is thus not easy to make out whether the position is an occipito-anterior or posterior one. This may, however, be done in a fair proportion of cases if the head does actually, as is not, however, the rule, lie in one of the oblique diameters of the brim.

The lie and the direction of the back of the fœtus can be made out in this way far more certainly and fully than by vaginal examination. In cases of vertex presentation the heart can, as a rule, be best heard on the

side opposite to that on which the limbs are felt or seen ; and it may be here said that in face presentations (which we have yet to consider) the heart, owing to the extension of the fœtal body, and consequent projection of the chest against the uterine wall, is best heard on the same side as the limbs.

So that if the heart is plainly heard on the dorsal side of the child, it may be fairly concluded that the presentation is a vertex one.

The arrangement of the hands should now be changed, and the observer should stand so that he looks towards the woman's feet. The tips of the fingers will be directed to the pubes. Making out the anterior shoulder, he

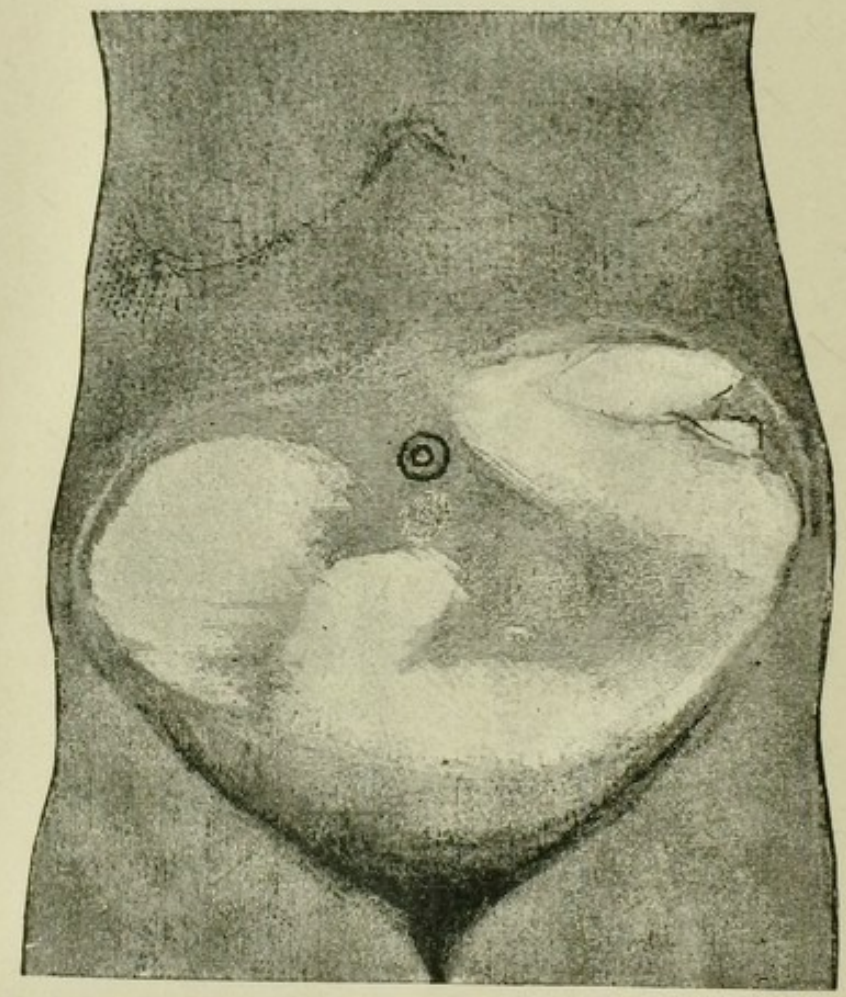

Fig. 178.—Abdominal palpation in transverse lie. N.B.—The fœtal head is at a higher level than usual.

will be able by firm pressure with the pulp of the fingers, one hand being on each side of the child, to find the base of the skull, and after some little practice will distinguish the occiput, which runs down into the brim in a plane almost continuous with that of the back, from the more projecting forehead (see fig. 176), and thus absolutely determine that the presentation is a vertex, and not a face or a brow ; for in the two latter cases, and more markedly in brow presentation, there will be a prominence on both aspects of the child, the chin in the brow cases being often very readily recognisable.

In making these observations, it is enough in many patients to simply

place the hands in the various positions mentioned, and press gently on and through the surface. In some women, where the abdominal walls are thick or there is some muscular rigidity, or where there is a larger quantity than usual of liquor amnii, far better and more certain results are got by 'dipping,' a method well known in connection with palpation of the liver in a dropsical abdomen. It is surprising how easy it is to make out fœtal parts in this way, when by simple pressure a confused notion only can be obtained. To perform it, the pulps of the fingers, not the tips, are laid on the surface, and then by a sudden downward movement, which depresses the abdominal and uterine walls, the liquor amnii is displaced, and the solid fœtus beneath is felt as a momentary but remarkably distinct impression; and, by a succession of these dips, the fingers travelling over the surface of the uterus as rapidly as recognition of the parts allows, a very clear composite impression is produced of the surface of the child which is being examined.

The importance of abdominal examination as a means of diagnosis can hardly be overestimated, and the student is most strongly recommended to practise it at every available opportunity.[1] Long series of cases occurring in lying-in institutions have been published lately, in which, with a view of avoiding septic infection, all necessary information as to the position and lie of the child has been obtained without any vaginal examination, and by abdominal palpation only. It is, however, not for a moment recommended that any attempt should be made to perform this feat by the student or physician, since vaginal examination is absolutely necessary for the purpose of recognising many abnormal conditions which would give no evidence of their existence per abdomen. Presentation of the cord (p. 514) is an example.

Abdominal and vaginal examination may be combined with the greatest advantage. Many somewhat obscure cases—in fat subjects, for instance—are readily cleared up by a bimanual examination of the part of the child which lies in the pelvis or at the brim. Bimanual examination in this way should conclude every vaginal examination.

CHAPTER XIX

FACE PRESENTATIONS

We have to deal now with presentations of the opposite end of the head-ovoid. These presentations will be found to obey the same general laws as those which hold in vertex cases, the difference being that other diameters of the head govern the movements of this part of the fœtus, owing to the head being **extended** *instead of* **flexed.**

There are two **disadvantages** which exist in face presentations as compared with those of the vertex—namely, that a blunter end of the head-ovoid

[1] The subject is treated very completely in a most useful pamphlet by Credé and Leopold, translated by Dr. W. H. Wilson, *A Short Guide to the Examination of Lying-in Women* (Kingston, 1894).

has to dilate the genital passages (compare figs. 142 and 143, p. 129), and that the transmission of the axis-pressure of the uterus through the fœtal trunk to the head takes place at a less favourable angle. For the force exerted on the base of the skull is seen by the diagram to act almost at a tangent on the spheroid of the head, and is thus not so perfectly transmitted as when it is applied at a more direct angle to the surface, as in vertex positions (fig. 179).

Fig. 179.—Relation of head to trunk in face presentation.

Frequency.—Face presentations occur in about the proportion of rather over one to three hundred of all cases.

Mode of Production.—They are produced from the usual semi-flexed attitude of the fœtal head in pregnancy by several causes.

1. *Obliquity of the Uterus.*—The usual inclination of the uterine axis is to the right side. Consequently, the line of the fœtal axis-pressure is directed somewhat to the left, as well as downward and backward (fig. 180). The point of application of this force to the head is at the occipito-atloid joint, a point on the upper surface (in this lie) of the head. The resistance of the pelvic brim acts at a point at or below the horizontal equator of the head, according to the amount of engagement at the time the axis-pressure comes to be exerted (see p. 103). The force and the resistance form a 'couple,' which causes the head to rotate on an antero-posterior axis in the direction of the curved arrow. This rotation in the case of a fœtus lying with its

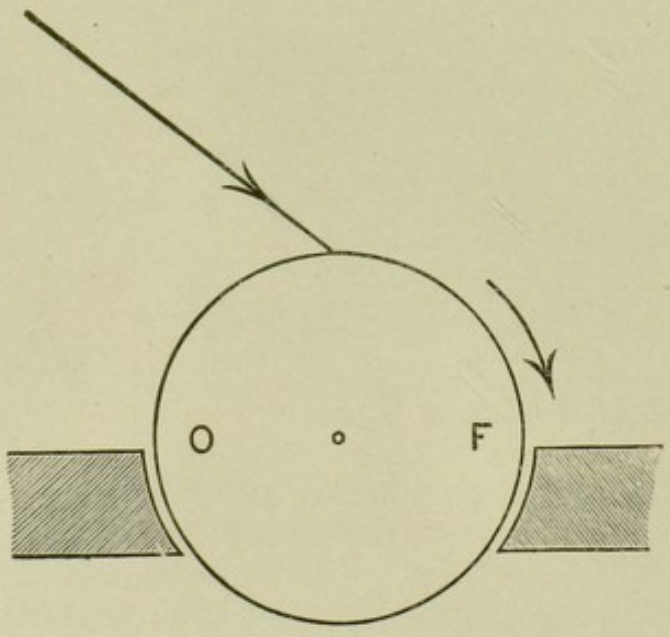

Fig. 180.—Effect of obliquity of fœtal axis-pressure on head at brim. *O*, occipital; *F*, frontal end.

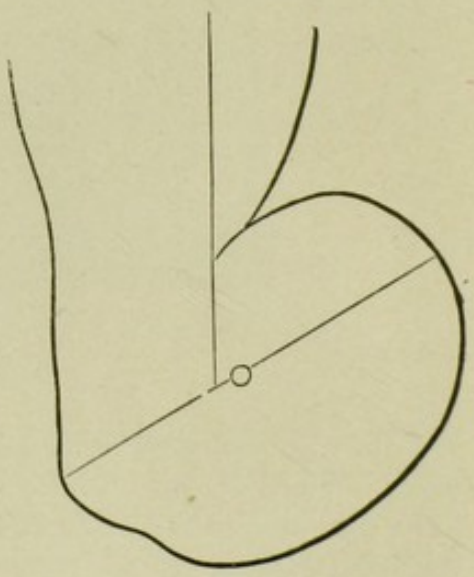

Fig. 181.—Effect of fœtal axis-pressure on a partly-extended head.

occiput to the left would be in the direction of increased flexion (fig. 151). In cases where the back is to the right, however—that is, in the second or third position of the vertex—the action of this couple is towards extension

of the head (fig. 180), tending to produce first a brow presentation, and then a face.

It will be seen, on referring to fig. 200 (p. 165), that in a brow presentation the point of attachment of the spinal column to the base of the skull lies over the middle of the long diameter of the head-ovoid, and that a slight degree of flexion (fig. 152) shortens the occipital portion of the lever. In the same way a slight degree of extension beyond that present in a brow presentation shortens the frontal portion of the lever, and produces further extension (fig. 181) into a complete face presentation.

The proof that obliquity of the uterine axis does produce this result is shown by the following considerations. The uterus is nearly always inclined to the right, and on the present hypothesis it would have a greater tendency to convert cases in which the back looks to the right into face presentations than those in which the back looks to the left. It is actually found to be the case that left dorsal positions predominate over right dorsal positions in vertex presentations in the proportion of about three to one; while in face presentations, left dorsal positions have the lesser predominance of only four

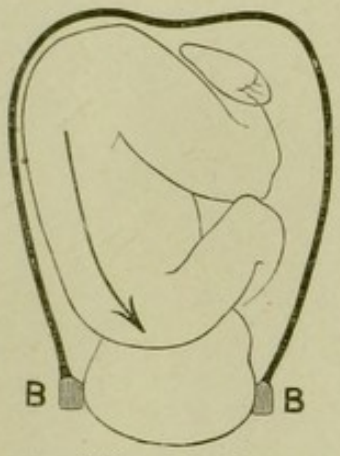

Fig. 182.—Effect of cordate uterus on fœtal axis-pressure.

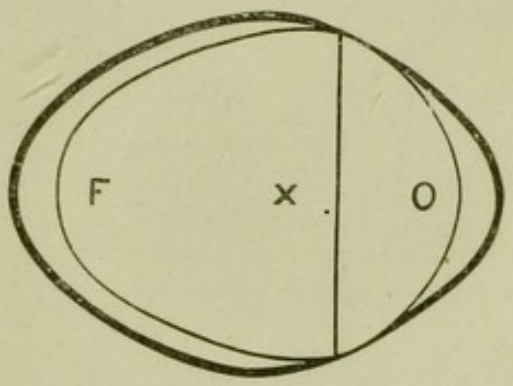

Fig. 183.—Elliptic pelvis. *F*, frontal; *O*, occipital end of head; × = situation of condyles.

to three. This shows that there is a greater tendency for left dorsal than there is for right dorsal positions to remain as vertex presentations; or in other words, there is a greater tendency for right dorsal positions to become face presentations than there is for left dorsal positions to do so.

It is said that the cordate uterus may have the same effect, the result depending on whether the breech of the child lies in the lobe to the abdominal or dorsal side of the child (fig. 182).

2. *Abnormal relation of Pelvic Brim to the Bi-parietal Diameter.*—In the flat pelvis, with a brim of the elliptical type (see p. 435), the bi-parietal diameter is caught at the brim, and arrests the head. Pressure exerted through the vertebral column acts now in a line falling in front of this diameter (fig. 183), and the forehead descends, the head rotating round the bi-parietal diameter as an axis into a face presentation.

It is possible that an analogous process takes place in some cases in a normal pelvis with a disproportionately large head.

3. *Dead children* present by the face in a larger proportion than living ones. They may approach the brim in almost any attitude of the head, as

there is an entire absence of muscular tone. Under these circumstances, slight obliquity of the uterus (if towards the side of the back of the fœtus) readily converts the attitude of unstable equilibrium into a face presentation.

4. In the rare instances where a *goître* is large enough to cause extension of the head by its bulk, the face necessarily presents.

5. In addition to these undoubted causes, it has been said[1] that *dolicho-cephalic* children are very liable to present by the face. To be an independent cause of the production of extension from previous flexion, the dolicho-cephaly, it will be seen, would have to be very marked indeed, and this has not been shown to be the case in any child so born.

Mechanism of Face Cases in General

After what has been said of the forces which govern the mechanisms of vertex presentations, there is no need to make a statement of the general principles of the process, for face cases differ from vertex cases in the details only. (Figs. 184 and 185 may be compared with figs. 148 and 149.)

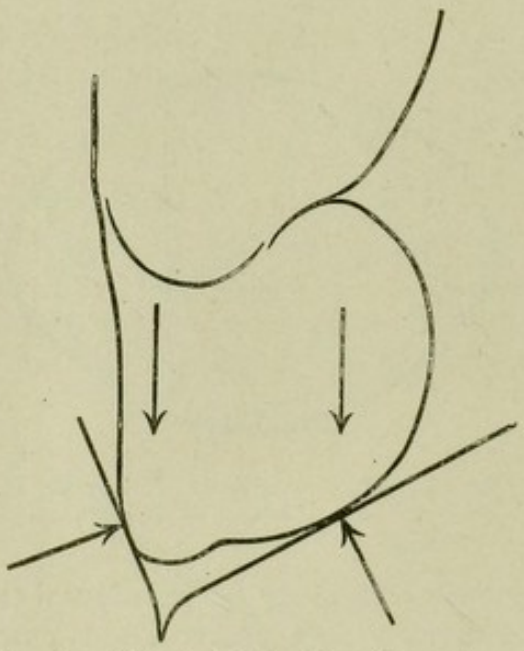

Fig. 184.—Differing inclinations of mental and frontal planes in face presentations.

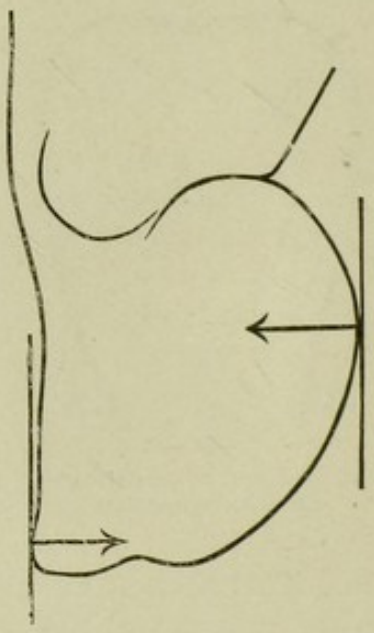

Fig. 185.—Effect of inward pressure of walls of birth-canal on head in face presentations.

The points of difference are :—

1. The chin takes the place of the occiput in being the leading part of the head in descent, and the occiput comes last. The head-ovoid is thus inverted.

2. The submento-vertical (cervico-vertical) diameter (4½ in.) takes the place throughout labour of the sub-occipito-frontal (4 in.) The passage of this larger diameter is proportionately delayed.

3. The chin in face presentations does not come so far in advance of the rest of the head as the occiput in vertex presentations, so that rotation of the chin forwards (in the case of its being directed backwards as the head enters the pelvis) occurs rather later than rotation forwards of the occiput in occipito-posterior positions.

[1] Hecker, *Ueb. d. Schädelform bei Gesichtslage.*

4. Moulding takes place with more difficulty than in vertex cases, for the whole hind-head has to be bent downwards and compressed against the neck (figs. 185 and 190).

5. The head is delayed longer at the brim, as the change from flexion or semi-flexion has to be accomplished before advance can be made.

It is of importance to remember also that the thickness of the upper part of the neck has to be added to the diameters of the posterior part of the head.

On account of the conditions mentioned in 2, 3, 4, and 5, labour in face cases is as a rule more protracted than in presentations of the vertex.

The **positions** in face presentations are four, as in vertex cases, and they are named according to the direction of the chin. In numbering them (which is scarcely a necessary complication) they are made to correspond to the vertex positions from which they have been, or might have been, evolved.

First. Right Mento-posterior.—Long diameter of the face in the right oblique diameter of the pelvis. The head, by extension, lies so that its forehead occupies the place where the occiput lies in first vertex positions.

Second. Left Mento-posterior.—Long diameter of face in left oblique. The forehead occupies the place of the occiput in the corresponding vertex.

Third. Left Mento-anterior.—Long diameter of face in right oblique. The same remarks apply as to forehead and occiput.

Fourth. Right Mento-anterior.—Long diameter of face in left oblique. Forehead and occiput as in the other cases.

There is little or no object in remembering the numbers, but it can easily be done by keeping in mind the fact that the forehead takes in face cases the place of the occiput in vertex cases, and that the back of the fœtus has in each position the same direction as in the vertex position with the corresponding number; in first and fourth face presentation the back is to the left, and in second and third to the right.

Special Mechanisms

First Face. Right Mento-posterior.—This is the commonest of the face presentations. Face in right oblique, forehead anterior. The back of the fœtus is to the left, and by further *abdominal examination* the angle between the occiput and the back of the neck is found on the left side of the abdomen; the limbs are to the right; the fœtal heart is best heard, if heard at all, to the right (compare first vertex), on the same side as the limbs.

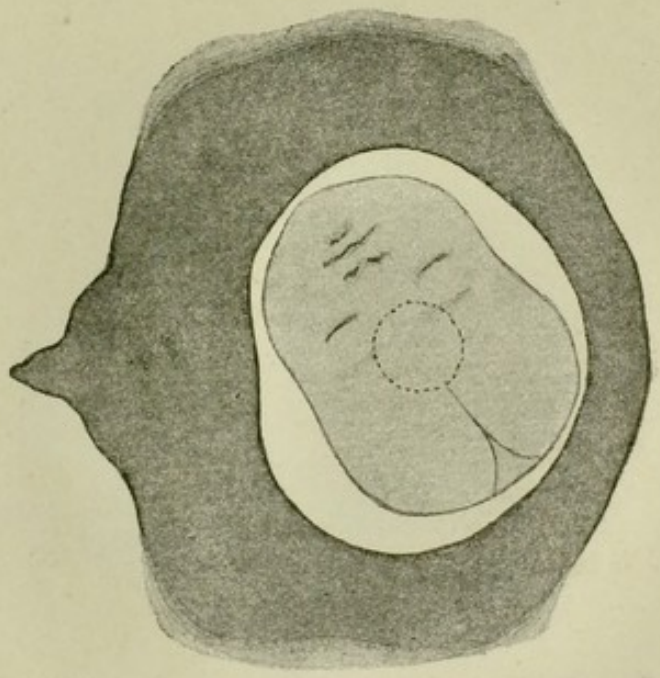

Fig. 186.—First face presentation. Pelvis in left side, seen from below.

Per vaginam, if the os is sufficiently dilated, some part of the face may be felt, probably the orbital and glabellar region, and the bridge of the nose

traced backwards and upwards (in the ordinary obstetric position), as seen in fig. 186, to the mouth, where the alveolar ridges are to be recognised. Beyond

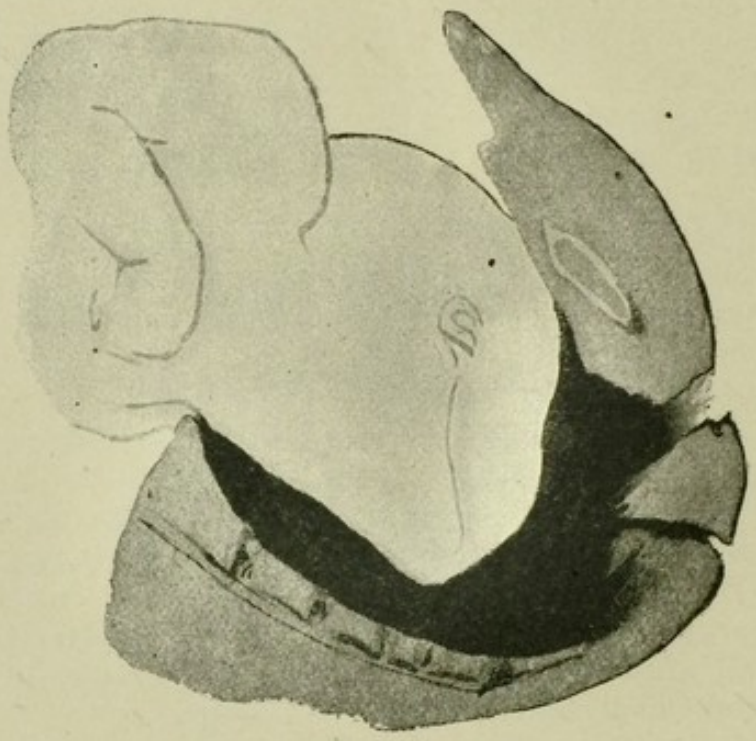

Fig. 187.—Mechanism in first face presentation.

this the chin may be felt if the head is already pretty well extended. Downwards and forwards the smooth forehead extends, being more or less within reach, according to the amount of extension.

The right cheek is anterior.

Movements. — The head becomes more extended and reaches the pelvic cavity, through which it passes in the right oblique (figs. 187, 188).

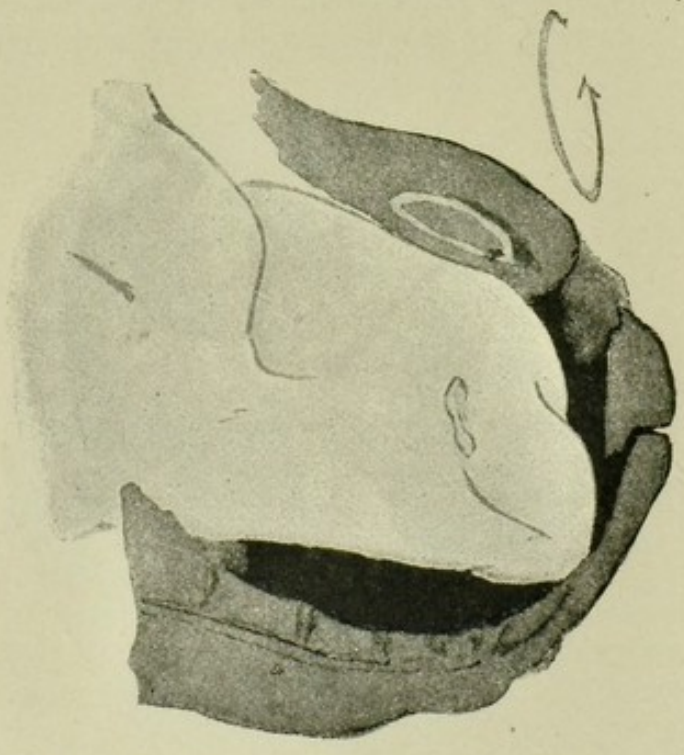

Fig. 188.—Mechanism in first face presentation. The curved arrow shows the direction of the chin-rotation.

On reaching the pelvic floor, the chin is directed by the slope of this round the right side of the pelvis towards the pubic arch. The chin is not so far in front of the rest of the head as the occiput is in vertex cases, and so rotation forwards is often somewhat delayed.

There is less tendency than in occipito-posterior positions of the vertex for the posterior pole (the chin in this presentation) to turn into the sacral hollow, for the long diameter of the face is shorter than the

occipito-frontal diameter of the vertex, and the shape of the bony pelvis has thus less power of opposing the action of the pelvic floor. (See Unreduced Occipito-posterior Positions of the Vertex, p. 145.)

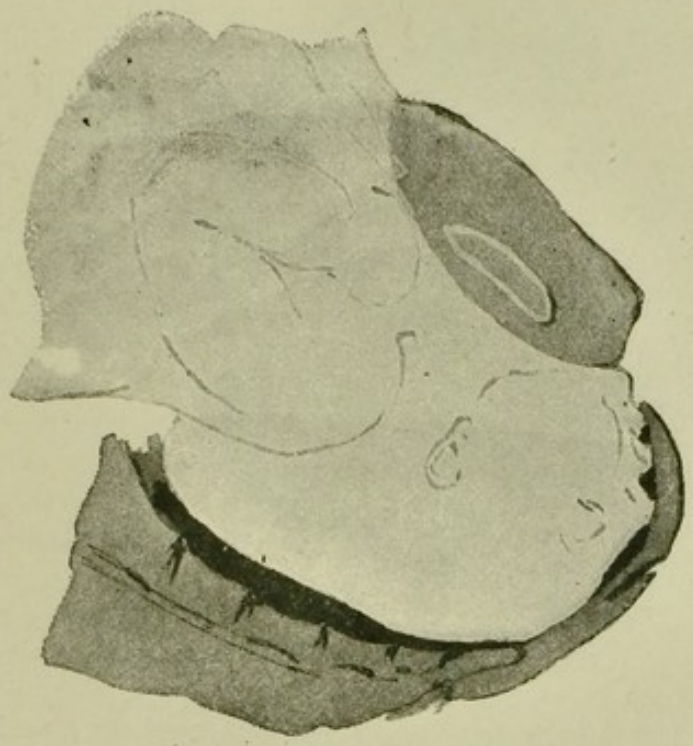

Fig. 189.—Face presentation after rotation of chin forward.

The chin rotates almost invariably through three-eighths of a circle round the right side of the pelvis to the pubic arch, and the face lies in the antero-posterior diameter (nearly) of the outlet (fig. 189).

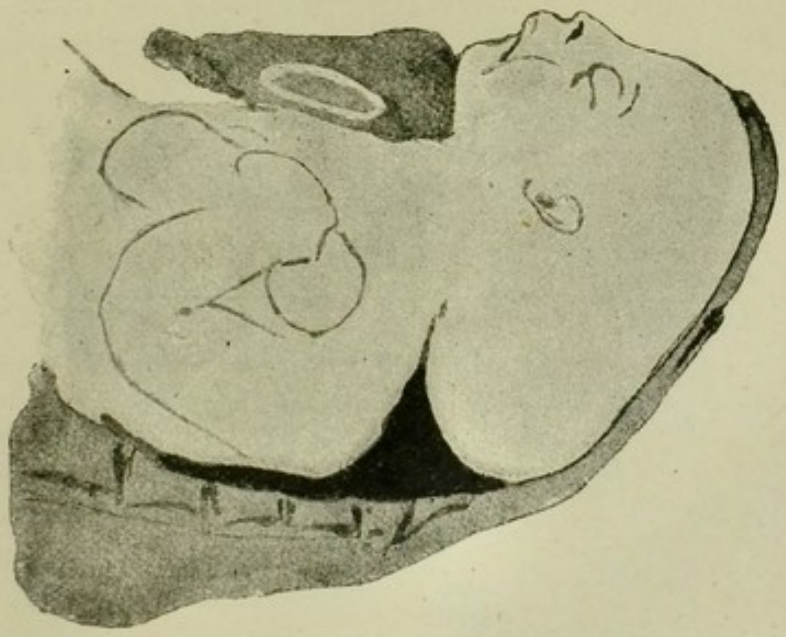

Fig. 190.—Face.

Then the head is pressed forwards by the pelvic floor, the chin appears at the vulva, and the angle between the neck and chin hitches beneath the pubic arch (fig. 190).

The head now moves forward by *flexion*, and the face, forehead, vertex, and occiput successively clear the perinæum (fig. 191).

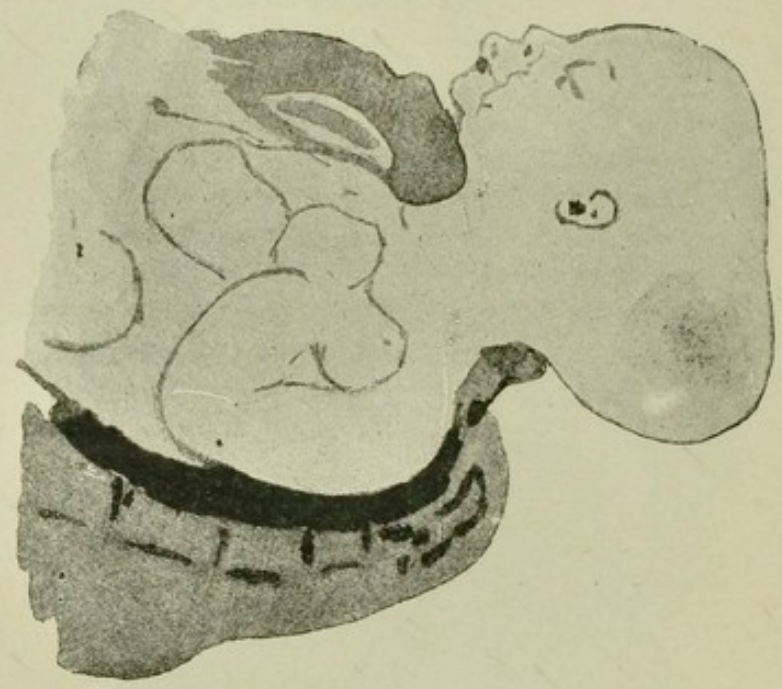

Fig. 191.—Face presentation. Birth of head.

The head, being now free to move, assumes its usual position on the shoulders, which have by this time rotated into the right oblique diameter, the right shoulder being to the front as at the beginning. The face therefore looks to the mother's right thigh, and rather forwards. On the right shoulder coming under the pubic arch, the rotation of the bis-acromial diameter into the conjugate causes the face to rotate so as to look directly to the right. This is the same restitution as occurs in vertex cases, and obeys the same rules, finally bringing the face to look in the same direction as the one in which it looked when engaging at the brim.

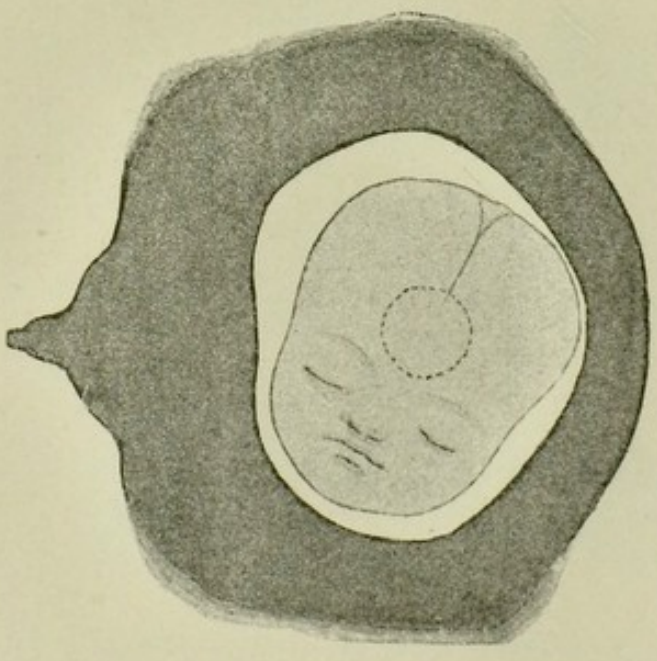

Fig. 192.—Second face presentation.

Second Face. Left Mento-posterior.—The face in the left oblique, the forehead anterior. The back of child to the right, and the limbs to the left. The angle between the occiput and the back looks to the right ; the heart is best heard, if at all, to the left.

The left cheek is anterior.

The head descends, rotating in the opposite direction to that which is followed in right mento-posterior positions, and restitution takes place with the face towards the left.

In both these presentations, which resemble in mechanism the two occipito-posterior positions (3 and 4) of the vertex, the chin has to rotate round three-eighths of a circle to reach the pubic arch.

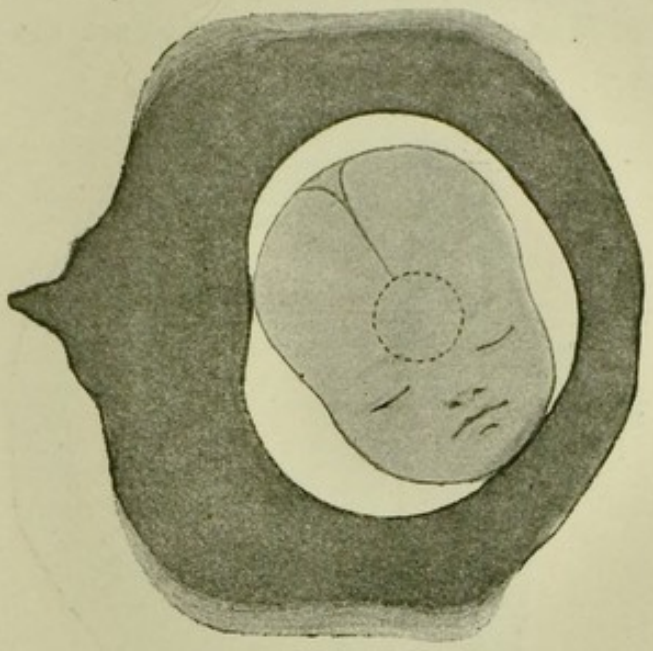

Fig. 193.—Third face presentation.

Third Face. Left Mento-anterior.—The face lies in the right oblique diameter of the brim, the forehead backward. The back of the fœtus is to the right and the limbs to the left; the fœtal heart is best heard to the left.

The left cheek looks forward.

As the face descends, with extension becoming more marked, the chin is directed under the pubic arch, turning through one-eighth of a circle. The head is born by flexion, as in the previously described face mechanisms, and when it is free it rotates so that the face looks to the left and forward. The shoulders are in the left oblique, with the left shoulder in front. As the shoulders rotate into the conjugate, the face moves round to look directly to the left.

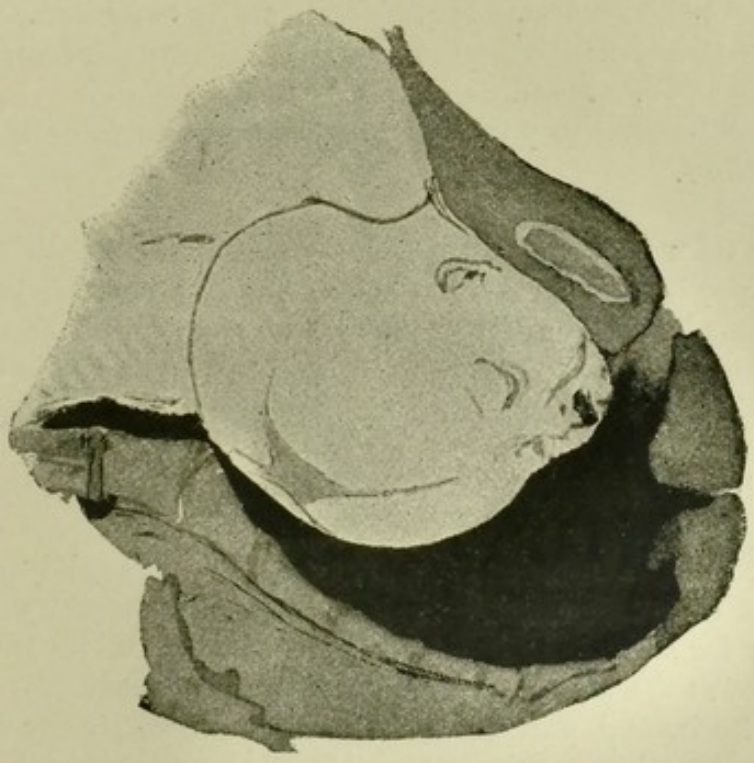

Fig. 194.—Mechanism in third position of the face.

Fourth Face. Right Mento-anterior.—The face lies in the left oblique diameter of the brim, with the forehead backwards. The back of

the fœtus is to the left, the limbs to the right, and the fœtal heart is heard to the right.

The right cheek looks forward.

The rotations and restitution are the reverse of those described in the last position.

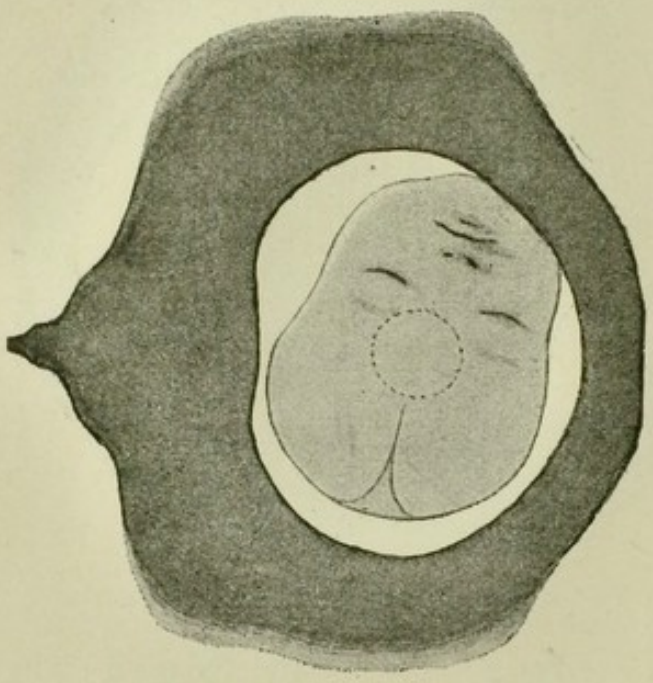

Fig. 195.—Fourth face presentation.

The mechanisms of the various face presentations, especially the direction of external rotation, are best remembered by keeping in mind the back of the fœtus. This has at the beginning of labour the same aspect as in the correspondingly numbered vertex position. The forehead in face cases has the same aspect as the back, and the chin as the abdomen.

The chin is the salient point on the presenting surface, and, like the occiput in vertex cases, governs the rotations.

Contrasting face and vertex mechanisms :

In *vertex* there is flexion ; the fourth position rotates into the first ; the third rotates into the second. Head delivered by extension.

In *face* there is extension ; the first rotates into the fourth ; the second rotates into the third. Head delivered by flexion.

And in mento-posterior positions reduction occurs later than in occipito-posterior positions.

Moulding in Face Presentations.—In face presentations the diameter most compressed is the cervico-vertical, or one between this and the cervico-bregmatic, along with the other diameters of the section at this plane, and the diameters of other planes parallel to this and behind it. Each succeeding plane, following the series towards the occiput, has below it a greater thickness of neck than the one in front of it (fig. 189).

The head is diminished in the diameters of these planes, and assumes the shape shown in the diagrams (figs. 190, 191).

It will be seen that in most cases there is an, at first sight, unaccountable prominence of the forehead. This has been explained by supposing that the head was for some time in a brow presentation in its transition from a vertex to a face at the brim. It is more simply accounted for by remembering that the horizontal part of the frontal bone is rigidly united with the base of the skull, and its vertical part only gradually thins off to the anterior fontanelle. The vault of the skull here does not obey the compressing force so readily, and so remains somewhat prominent.

(It would be almost impossible for a sufficient amount of moulding to take place above the brim while the head was in a brow presentation

without some impaction, and in any case there would be but little chance of the presentation being readily converted after such moulding into a face presentation. The prominence of the forehead is as frequently found when there has been no delay at the brim as it is in cases where the brow moulding might possibly have occurred.)

The diameters lengthened are the occipito-frontal and the occipito-mental. Those shortened are the submento- (cervico-) bregmatic, the suboccipito-bregmatic, with the transverse diameters corresponding to these (fig. 191).

The vessels of the neck and the thyroid gland are much exposed to pressure during the passage of the head through the pelvis, as will be seen from the diagrams.

The caput succedaneum, if one is formed while the face is at the brim, is around the eye which lies anterior—in first or fourth positions the right, in second and third the left.

If, as is usual, the caput is formed in the lower part of the vagina, it is near the angle of the mouth, right or left as above.

Owing to the laxity of the tissues of the face, and to the slower progress of labour, the swelling is often very great, and covers a large area, and subconjunctival hæmorrhages are pretty frequent.

Unreduced Mento-posterior Positions

Mento-posterior positions sometimes remain unreduced just as do occipito-posterior positions. This is, however, an extremely rare event, and fortunately so; for with a normal pelvis and a full-sized head *delivery cannot be completed with the chin backwards*. It is rare, because the mento-frontal measurement (about $3\frac{1}{4}$ in.) is much shorter than the occipito-frontal ($4\frac{1}{2}$ in.), and the bony canal cannot exercise its influence over the head. This is left, if extension is pretty complete, entirely under the influence of the pelvic floor, which, as we have seen, invariably directs the part of the head which first impinges on it towards the sub-pubic space.

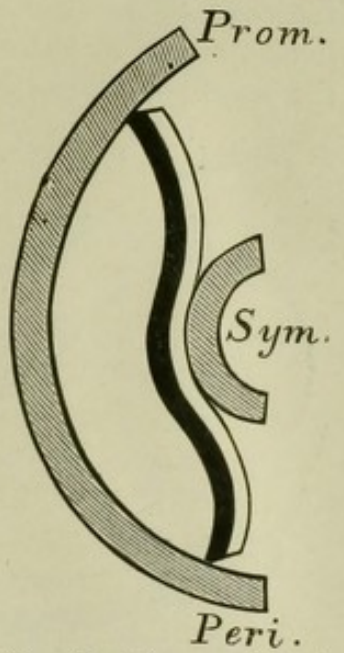

Fig. 196.—Diagram of elastic rod. Black side is concave (flexor side) when rod free; light side is convex (extensor side). *Prom*, promontory; *Sym*, symphysis; *Peri*, perinæum.

In addition, when a face presents the head is over-extended, and its muscles and soft parts are in a state of great tension, those on the anterior aspect—the flexors—being much overstretched. There is, in consequence, a very strong tendency towards flexion, and resistance to further extension.

The fœtus is then like an elastic rod, whose normal shape is a bent one, lying in a curved tube so that it is in a strained attitude and has its curve reversed. If the rod can move in the tube without friction, or rather with very little, it will when it is pushed down the tube almost immediately rotate on its long axis, so that its normal curve is restored, and it comes to lie with its curve corresponding to that of the tube.

If the dark side of the rod (fig. 196) is considered to represent the flexor (front) aspect of the neck, it is easily seen that this side will tend to turn towards the symphysis if the fœtus is free to rotate.

Supposing, however, extension is not good, and a diameter approaching the mento-vertical lies in the pelvic planes throughout which the head is

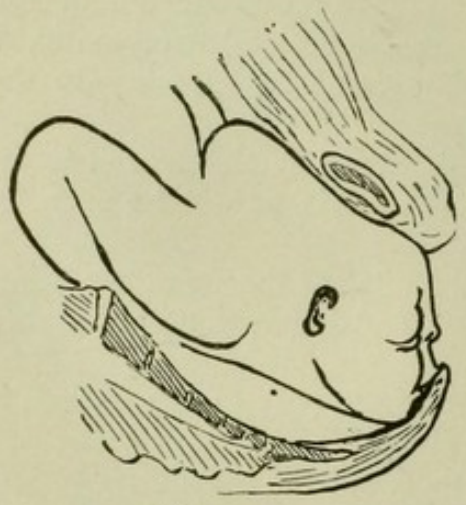

Fig. 197.

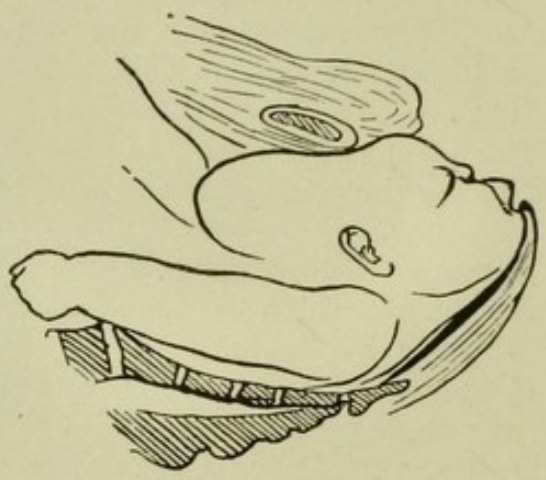

Fig. 198.

Persistent mento-posterior mechanism.

passing. The head would be nearly in the attitude of a brow presentation, and the diameter engaged would measure about 5 in. It is clear that the shape of the pelvis will prevent forward rotation, and the chin will turn into the nearest space—namely, backwards into the hollow of the sacrum.

There is a great difference between the state of things here and that in the corresponding unreduced occipito-posterior position. In the latter the head flexes a little more, and the occiput clears the perinæum, thus freeing the head ; but here the anterior fontanelle is jammed against the back of the pubes (fig. 197), and, to enable the chin to clear the perinæum, extension to a degree impossible in a living full-sized child must take place. The head, neck, and upper part of the thorax thus form a wedge, which advances into the pelvis to a distance depending on the smallness of the child, and which is, unless the child is very small or is dead and flaccid, arrested and impacted.

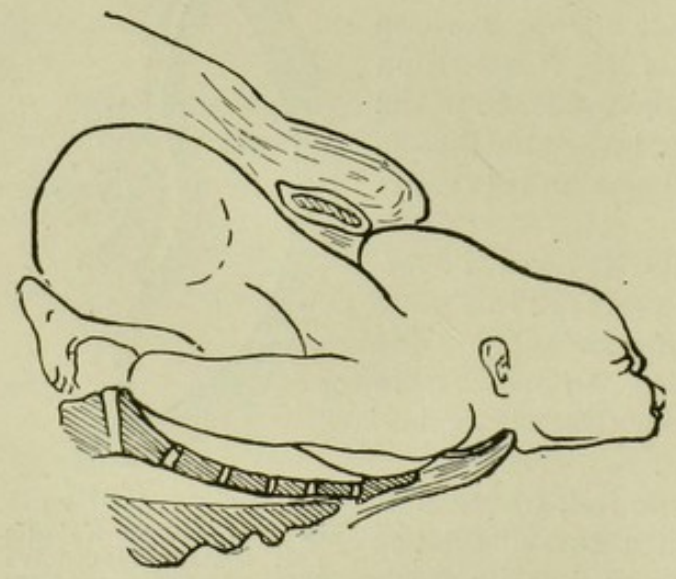

Fig. 199.—Persistent mento-posterior mechanism.

For delivery to be accomplished with a full-time child, the head has to be reduced in size by perforation (see p. 387), unless the chin can be rotated forwards before it is too late.

In the cases where delivery has occurred with a small and dead child, the chin has slipped over the perinæum, and the head has been born by flexion (figs. 198, 199).

Moulding and Caput Succedaneum.—The moulding is the same as in other face presentations. The caput would be situated over the eye and adjacent parts, on that side of the face which lies anterior in the pelvis.

CHAPTER XX

BROW PRESENTATIONS

PRESENTATION of the forehead is a very rare occurrence when once the head has engaged in the pelvis, and the natural termination of labour in this attitude is almost impossible, at least in the case of a living child at term. It is an interesting presentation, for it throws some light on two mechanisms already described—namely, those of persistent occipito-posterior and persistent mento-posterior.

The head is in the attitude shown in the diagram (fig. 200), midway between extension and flexion, and the arms of the head-lever are of equal length. The head is consequently in an attitude of unstable equilibrium.

No doubt very nearly all face cases have to pass through this stage on their transition from vertex presentations, and until the head is engaged this attitude has no special interest.

When the head engages without flexion or extension having taken place, it must be considerably moulded at the brim, and the presentation may then remain a brow to the end.

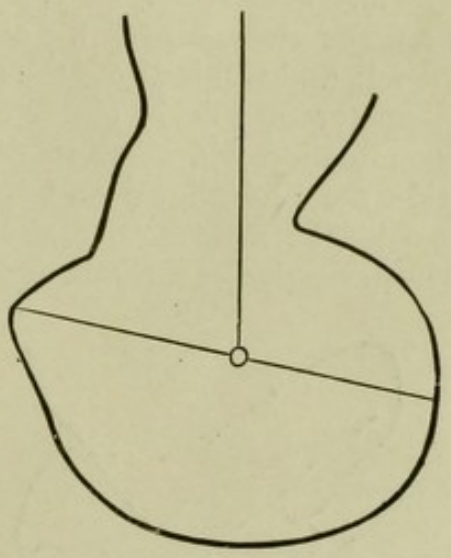

Fig. 200.—Action of fœtal axis-pressure on head between flexion and extension.

Mode of Production.—In numerous experiments with a fœtus and mannikin, Auvard found that he could by directing the expelling force applied to the breech of the child in an oblique downward direction, or in a quite downward direction, with the head in an intermediate state between flexion and extension, produce a vertex, face, or brow presentation at will. If he inclined the axis of the fœtus to the side towards which its back was turned, and pressed downwards, he got a face presentation ; if he pressed directly downwards, a brow presentation. This happened with the head either at the brim or in the cavity.

Probably in nature the head lies slightly flexed before labour has begun, and there is a slight obliquity of the uterus (or at all events of the fœtus) towards the side to which the child's back is directed, which produces some extension, but not enough to bring about a face presentation.[1]

[1] The other causes of face presentation (see p. 155) may also produce a brow presentation.

Cases of vertex and face presentation, where insufficient flexion and extension respectively take place to allow of the normal mechanism in occipito-posterior and mento-posterior cases, might therefore be included, one on each side of brow presentations, in a classification of cephalic lies.

Thus ; vertex proper, bregma, brow, malar region, face proper.

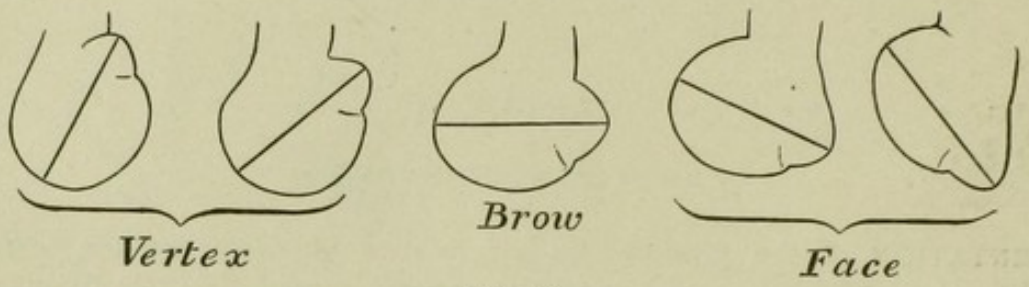

Fig. 201.

Mechanism.—The head lies with its longest axis, the mento-vertical (5½ in.) across the brim. The bregma is at one end of the presenting area, the glabella near the other (figs. 202 and 203). The orbital arches may be felt, and will indicate the anterior aspect of the child. The mento-vertical diameter may lie in either oblique diameter of the pelvis. An abdominal examination will show to which side the limbs look, and if the woman be a favourable subject, the projection of the chin and the occiput can be made out in this way above the brim.

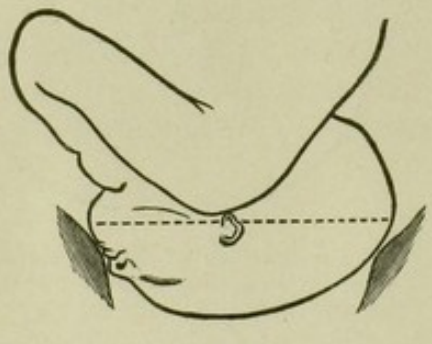

Fig. 202.—Relation of head to brim in brow presentation. (The dotted line corresponds to the mento-vertical diameter.)

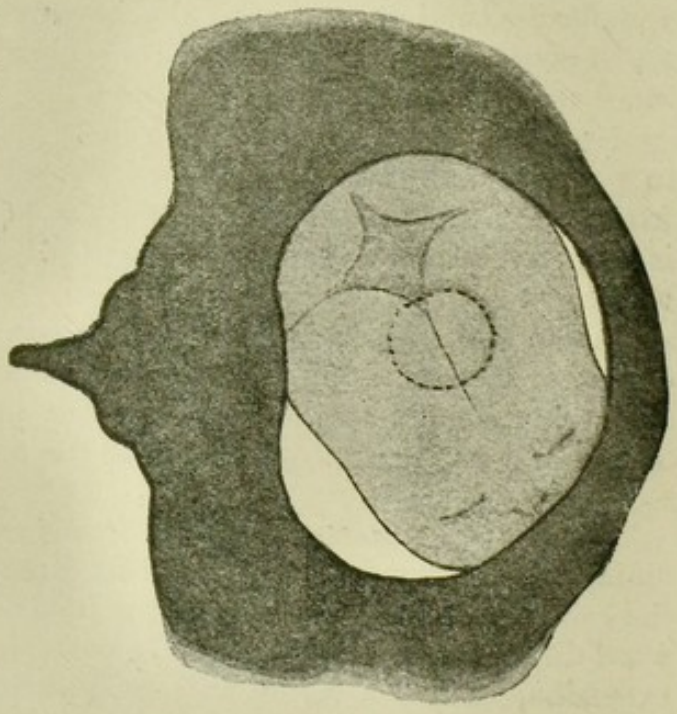

Fig. 203.—Brow presentation from below.

The head descends, having remained arrested at the brim for a long time while the mento-vertical diameter is being reduced by lateral pressure. Descent probably occurs by means of an advance of chin and occiput alternately, neither advancing sufficiently at any moment to produce a vertex or a face presentation.

The rotations are, in all probability, controlled almost entirely by the diameters of the bony pelvis, as the fit is an extremely close one.

Since the part of the presentation most in advance is in the centre of the presenting area, there is no marked tendency for the chin or the occiput to

come to the front. Whichever of the two is the lower, however, does so eventually, usually the chin.

The descent of the chin is due to a continuance of the obliquity which caused the presentation in the first instance.

The frontal eminence descends to the vulva, and presents there. The face is arrested at the lower margin of the pubic arch, and the head flexes, rotating round the point where arrest occurs, which is usually at the level of the malar bones, as a centre (fig. 204).

Fig. 204.—Relations of head and pelvis in brow mechanisms.

The vertex and occiput pass over the perinæum. When the latter is born, the mento-vertical diameter is free, and the head slightly extending again, the face passes under the pubic arch and the chin is born last.

If the chin rotates backwards instead of forwards, arrest occurs when a point near the vertex has arrived at the pubic arch. The chin descends by extension and is born over the perinæum; and the mento-vertical diameter being freed, the vertex passes under the pubic arch by flexion.

Delivery in the first case (chin in front) is practically impossible without assistance; and in the second in almost any case. With small or dead fœtuses it is different.

The diameters distending the vulva are, in the first case, a diameter which may be called the occipito-malar (about $4\frac{3}{4}$ in.); in the second the mento-vertical (over 5 in.) These diameters are, of course, reduced by moulding.

Restitution in delivery of the shoulders will take place according to the same rules as those which govern the mechanisms of presentations already described.

Moulding and Caput Succedaneum.—The distortion of the head in brow presentations is very great owing to the slow progress of labour; this in its turn is due to the relation of the head and pelvis. The frontal bone is rendered extraordinarily convex and prominent (fig. 204), and has on it the caput. The slope down to the occipital region is very steep.

The diameters lengthened are the occipito-frontal and the sub-occipito-frontal; those shortened are the cervico-bregmatic and the mento-vertical. The most posterior part of the head is, as in face presentations, compressed somewhat between the back of the neck and the pelvis.

CHAPTER XXI

PODALIC LIES

UNDER this heading are included all kinds of presentation of the podalic end of the fœtus, whether of the breech, of one or both feet, or of the knees.

Presentation of the breech is by far the commonest, since the child during expulsion remains in the same attitude as that which it has maintained during pregnancy.

The podalic end may present in the following attitudes :

Full Breech.—The thighs are flexed on the abdomen, and the legs on the thighs ; the legs are as a rule crossed so as to be closely applied to the general mass of the body.

Incomplete Breech. ('Siège décomplété, mode des fesses' of French authors.)—The legs are extended on the thighs, so that the feet are on a level with the shoulders (fig. 205). This attitude is sometimes reproduced after birth, the legs, which have been brought down for the purpose of aiding labour, at once flying back to their former place along the front of the child's trunk ; and in these cases it is probable that the child has lain in this attitude in the womb for some long period before birth. In other cases of incomplete breech the legs remain in their natural attitude after the child is free of the genital tract, and then it is clear that the malposition was an event of labour and not of development.

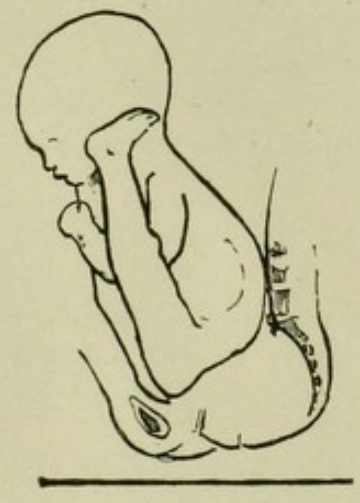

Fig. 205.

Knee Presentation.

Footling Presentation.—One or both feet may present. If only one, the half-breech remains on the side of the flexed thigh to dilate the maternal parts. This half-breech attitude is artificially produced in most cases where version is performed, as it has the advantage of not leaving the main part of the dilatation of the passages to the head. As will be immediately seen, this is a matter of supreme importance for the life of the child.

Frequency.—The proportion of podalic lies is about 1 in 40 of all cases. The full breech presents in about 60 per cent. (3 in 5) of podalic lies.

Causes of Podalic Lie.—The causes of the cephalic lie have been entered into at length, and it may be said that the absence of such causes, or rather their inversion, will favour the podalic lie. Thus, where the fœtus is the subject of *hydrocephalus*, its cephalic end is the larger one, and so occupies the larger end of the uterus—namely, the fundus (fig. 206). In the case of *premature children*, the specific gravity of the head is found to be not higher than that of the trunk, so the presentation is, as far as this cause is

concerned, indifferent, and the free mobility of the child in the uterus, owing to the comparatively small size of the former, prevents the usual action of the shape of the uterus on the fœtal lie.

Breech presentations are for the last reason relatively commoner in cases where there is *excess of liquor amnii*; and *laxity of the uterine walls*, a condition sometimes found in multiparæ, may perhaps have a similar tendency. In the conditions existing in *twin pregnancy*, where the two fœtuses form an ovoid with equal ends, there is no influence capable of being exerted by the uterine shape, and on looking at the statistics of presentations in twin labours it will be seen that, although head lies are commoner than others, the others are in greater proportion than in single pregnancies. Podalic lies are commoner in *contracted pelvis* than in the normal one, for the head cannot in them rest in the brim to any extent, and is therefore readily displaced off it; and moreover, the whole uterus is higher in the abdomen, and therefore more inconstant in its position, being often very oblique. In *placenta prævia*, the cephalic lie is less constant than in normal cases owing to the occupation of the lower uterine segment by the placenta.

Fig. 206.

Among podalic lies, footlings and knee presentations are in all probability due to the want of close fitting between the pelvis and the head; thus, footling cases occur oftener when the child is premature than when it has reached term; and oftener in a hydramnionic pregnancy than in one with the normal quantity of liquor amnii.

Positions.—The long diameter of the breech, the bi-trochanteric, may lie in either of the two oblique diameters of the pelvis, having in each the back either to the left or to the right.

The positions are named according to the direction in which the sacrum looks, and as this corresponds to the aspect of the occiput, it is easy to remember the breech positions if those of the vertex are thought of. The numbers of one correspond to those of the other.

The positions which have the back looking forward are the commoner for the same reason as that which causes this preponderance in cephalic lies—namely, the convexity of the lumbar spine; and the sacrum more often lies to the left because of the dextro-rotation of the uterus (see fig. 64, p. 48).

Mechanisms

First Breech.—Left sacro-anterior. This is the commonest.

The bi-trochanteric diameter lies in the left oblique (in the oblique crossing that occupied by the antero-posterior or sagittal diameter of the child).

On abdominal examination the back is found to the left, and the limbs to the right; the globular mass of the head is at the fundus (fig. 207). The fœtal heart is best heard as a rule to the left of the navel, and at its level or above it.

Per vaginam the cleft between the buttocks (which corresponds to the sagittal suture) lies in the right oblique diameter, and the sacral spines of

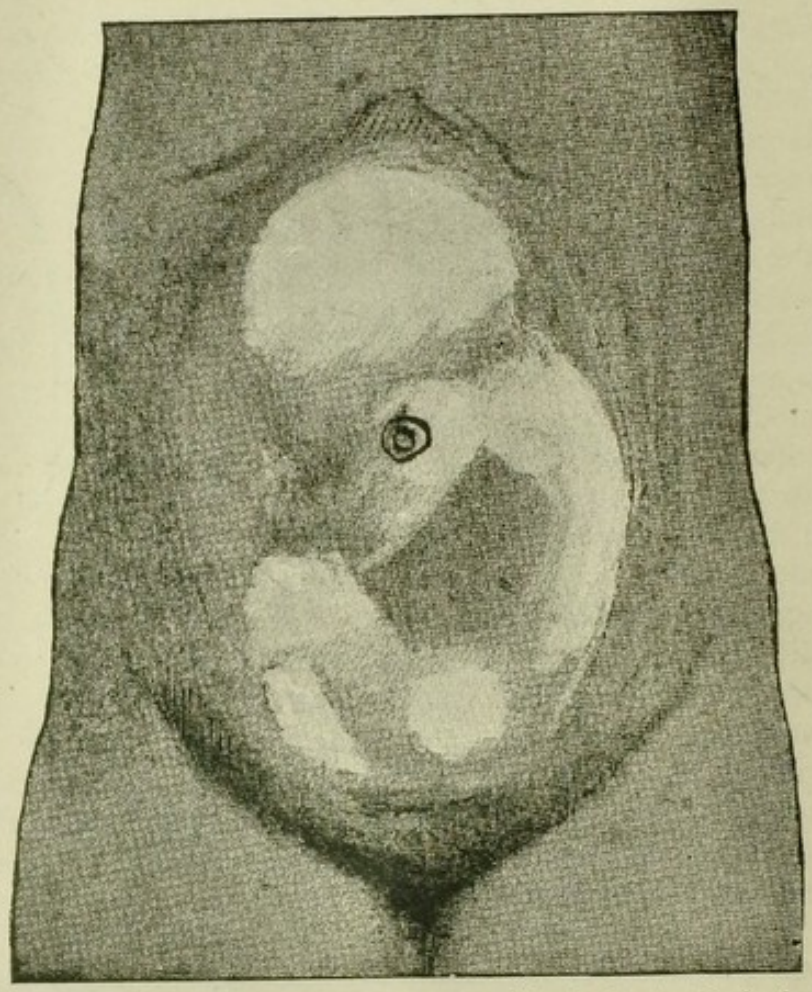

Fig. 207.—Graphic representation of what is felt on abdominal palpation in the podalic lie.

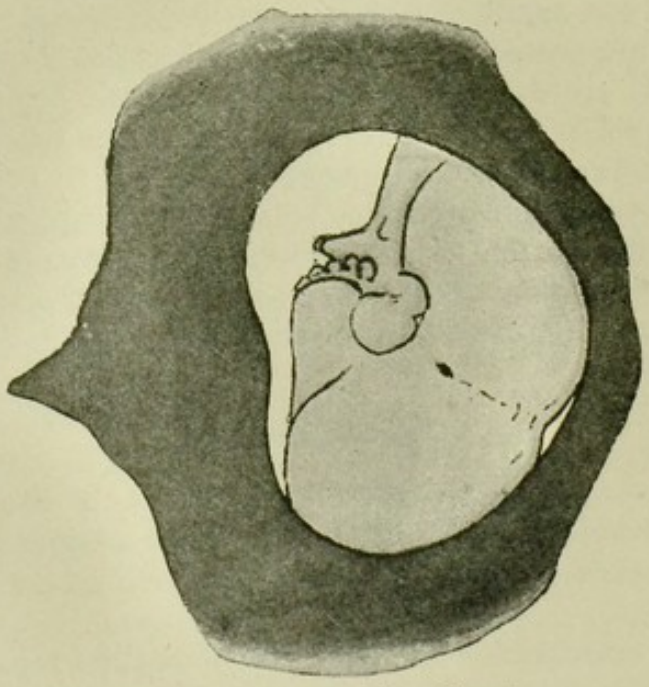

Fig. 208.—First position of breech.

the child's pelvis, corresponding to the posterior fontanelle, are felt to lie near the left foramen ovale (fig. 208).

Mechanism.—When the breech descends, the left trochanter comes to the front, owing to the shape of the pelvis, as the pelvic floor is reached ; thus

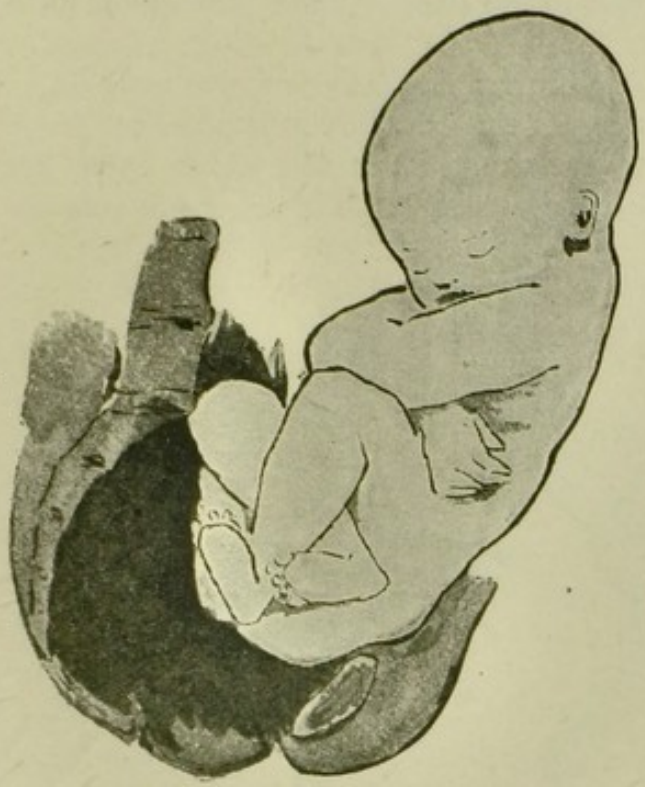

Fig. 209.—Mechanism in breech presentation.

Fig. 210.—Mechanism in breech presentation.

bringing the bi-trochanteric diameter (4 in. nearly) into the antero-posterior diameter of the outlet (fig. 210).

When the lower end of the body is pushed forward by the pelvic floor the trunk has to undergo a lateral flexion, to accommodate itself to the pelvic curve. The presenting part is now the left buttock, which is first felt on vaginal examination for the same reason that the anterior parietal bone is first felt in vertex presentations (fig. 210). The lateri-flexion of the trunk is combined with slight extension, because the child does not turn completely sideways to the mother ; just as in vertex cases, where the head does not rotate completely into the antero-posterior of the pelvis at the outlet, but only nearly so (p. 137).

Fig. 211.—Mechanism in breech presentation. Birth of buttocks.

The anterior buttock appears under the pubic arch, hitches about the trochanter until the posterior buttock has revolved round it for a small segment of a circle, and then both buttocks are born together (fig. 211).

The part played by the pelvic floor in rotating the bi-trochanteric diameter into, and retaining it in, the nearly antero-posterior diameter of the pelvis is the same as its mode of action in the case of the shoulders in head presentation (see fig. 159).

Immediately the hips are born, which happens at once, the position of the shoulders in the left oblique diameter of the brim (fig. 211) causes the hips to rotate back somewhat, so as to relieve the twist of the trunk. The left trochanter thus approaches the mother's right thigh. This external rotation

Fig. 212.

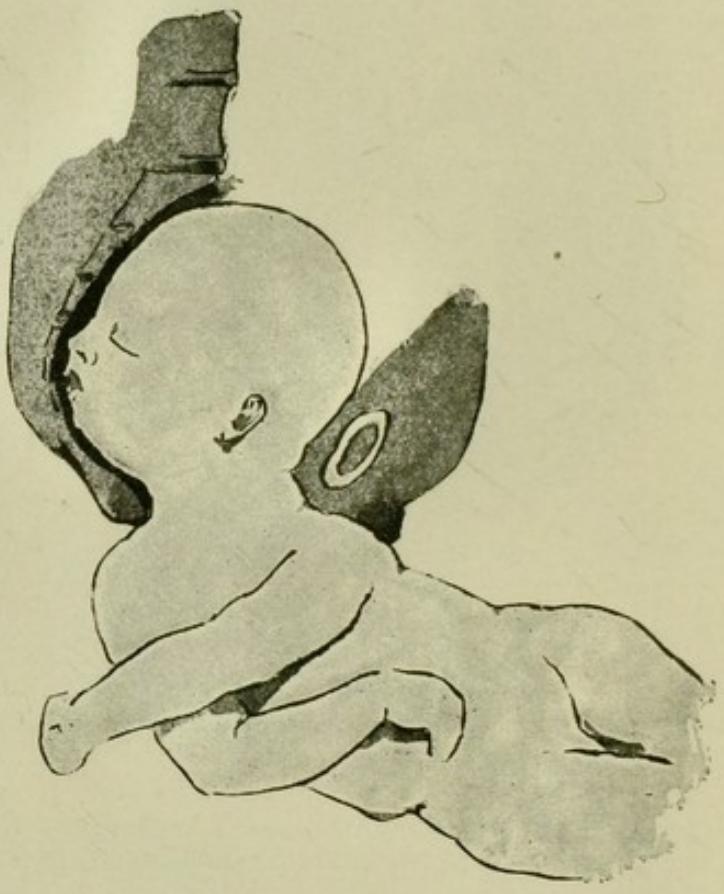

Fig. 213.—Birth of shoulders. The child's body has been carried forwards, producing apparent extension. The head, however, retains its flexed relation to the pelvic walls.

corresponds to the first slight movement of restitution immediately after delivery of the head in cephalic lies.

The abdomen, and then the arms folded across the chest, in turn make their exit.

The shoulders descend in the same diameter (fig. 212) and undergo the same rotation as the hips have just done, and the bis-acromial diameter turns almost into the antero-posterior diameter of the outlet of the vagina.

The head comes down into the pelvis *flexed* (fig. 212). The occipito-frontal diameter lies in the transverse, tending to the right oblique, the occiput being to the left and forwards. This long diameter is rotated into the antero-posterior pelvic diameter, the forehead going into the hollow of the sacrum (fig. 213).

The whole head is pushed against the lower edge of the symphysis by

the pelvic floor ; the nape of the neck hitches against this edge, and the face revolves round this point chin first and is delivered flexed (fig. 214), that is the mento-vertical diameter corresponds to the axis of the pelvis.

Delivery is often delayed at the stage when the head should pass the vulva ; for the head is the part of the fœtus which suffers most resistance from the passages, and the uterus is now contracted almost to its furthest limit, and is of very little use in expelling any part of the fœtus. The vagina and the abdominal muscles have in consequence to complete the delivery. This stage is always a critical one for the child, and is often an occasion requiring assistance.

As the head rotates into the antero-posterior diameter of the outlet, it causes the trunk to rotate further in the same direction as the one in which it started, and the left thigh and shoulder of the child lie in close relation with the right thigh of the mother (fig. 214).

Fig. 214.—Birth of head.

Second Breech : Right Sacro-anterior.—The bi-trochanteric diameter lies in the right oblique.

Per abdomen, the back is found to the right, and the limbs to the left, the head is at the fundus. The fœtal heart is heard to the right of and above the navel.

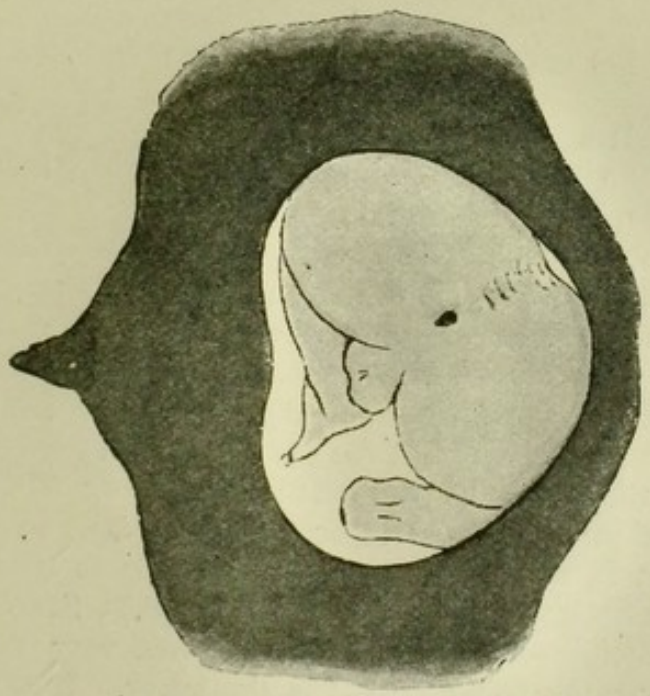

Fig. 215.—Second position of breech from below. Pelvis on left side.

Per vaginam, the cleft between the buttocks lies in the left oblique diameter, and the sacral spines lie near the right foramen ovale.

Mechanism.—Substituting right for left and left for right, the mechanism is exactly similar to that of the first position.

Third Breech: Right Sacro-posterior.—The bi-trochanteric diameter is in the left oblique. The back is to the right and somewhat backwards, and the limbs to the left and forwards. If the heart is heard, it is on the right side.

The cleft between the buttocks lies in the right oblique diameter, the sacral spines lie towards the right sacro-iliac synchondrosis.

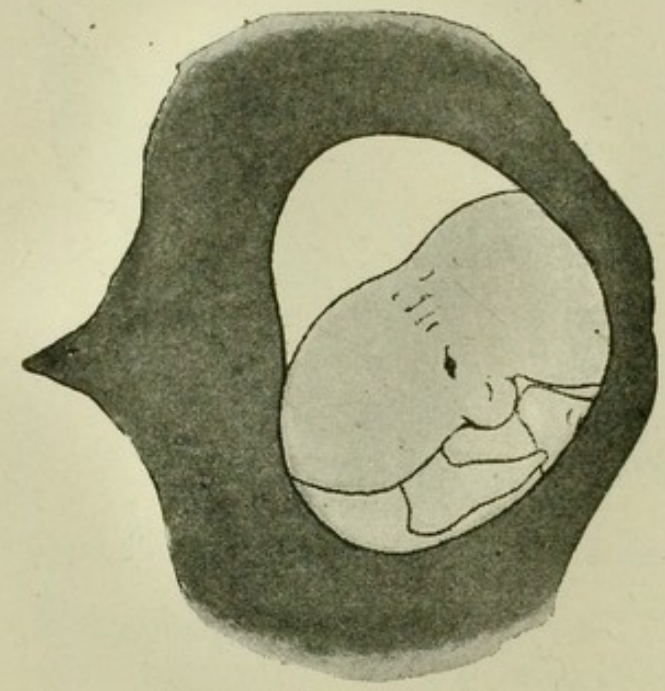

Fig. 216.—Third position of breech.

Mechanism.—The breech descends and the right hip rotates forward towards the pubic arch. There is lateri-flexion and some forward flexion of the pelvis to correspond to the curve of the genital canal.

The hips are born in the same manner as in sacro-anterior cases, and the child's abdomen faces the mother's left thigh.

The mechanism may be continued from this stage in one of two ways:

(**1**). The internal rotation of the body already begun by rotation forward of the right trochanter may go on until the shoulders come to lie in the right oblique, thus bringing the occiput forwards, and the head into the left oblique. The labour then terminates as a second breech.

(**2**). The shoulders may come down in the same diameter of the pelvis as that in which the hips engaged, and the head will then lie in the right oblique, with the occiput backwards.

If this happens, the occiput is rotated forwards by the pelvic floor, for two reasons. First, the head is flexed on the trunk, and for the upper part of the trunk to move forwards under the pubic arch, in obedience to the curve of the genital canal, the curve forwards of the fœtal axis, which has already become one of some tension, would have to be much increased, if the occiput remain posterior. But the fœtal axis is ready to bend backwards by extension of the head, so the fœtus rotates on its axis and comes to lie in the relation to the pelvic curve where it is in the condition of least tension—that is, where its curve corresponds to that of the passage; that is, with the back forwards. (See fig. 196.) Secondly, of the two poles of the suboccipito-frontal diameter (or one very near it) in contact with the pelvic floor, the sub-occipital is the lower. It is therefore guided round by the pelvic floor to the sub-pubic angle, and delivery proceeds as if the presentation were originally a second breech.

The two varieties of mechanism thus depend on the moment at which

rotation forwards of the back or the fœtus occurs. In the first method it takes place when the hips occupy the cavity, and in the second when the head comes into relation with the pelvic floor.

Rotation has been described as taking place at the time when the shoulders are in the cavity, and this would be at an intermediate stage.

Fourth Breech : Left Sacro-posterior.—The bi-trochanteric diameter is in the right oblique. The back is to the left and somewhat backwards, and the limbs to the right and forwards. The heart, if heard, is on the left side of the navel of the mother. The sacral spines look towards the left sacro-iliac synchondrosis, and the cleft between the buttocks is in the left oblique.

Mechanism.—The movements are similar, substituting left for right and the converse, to that of the third breech.

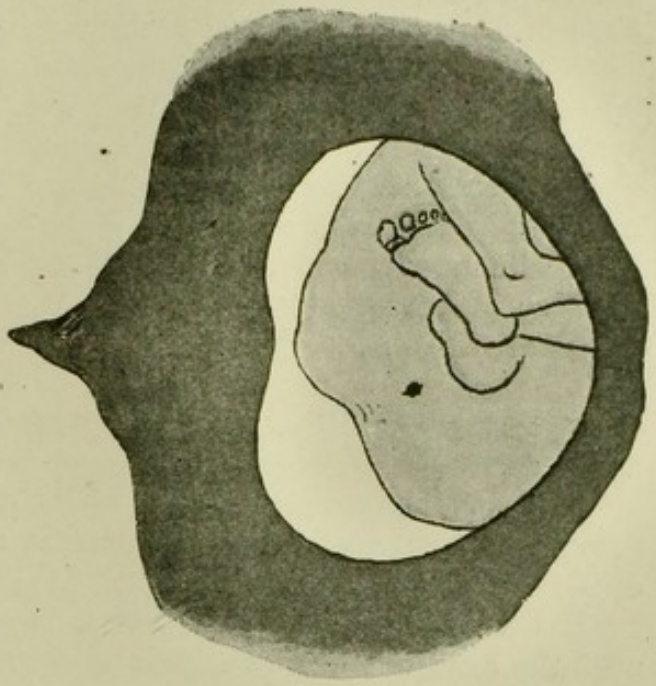

Fig. 217.—Fourth position of breech.

Abnormal Mechanisms in the Sacro-posterior Positions. If, in cases where the head descends into the pelvis with the occiput still backward, there is not good flexion, the occipito-frontal diameter which now lies across the pelvis causes a tight enough fit to bring the bony pelvis

Fig. 218.—Delivery of head, occipital posterior (1).

Fig. 219.—Delivery of head, occipital posterior (2).

underlying the muscles and fascia of the pelvic floor into play, and the head is rotated into the nearest long diameter ; that is, the occiput rotates into

the hollow of the sacrum. The head descends, and the occiput hitches on the edge of the perinæum, which lies in the nape of the neck. The head then flexes further on the chest, and the chin, nose, and forehead successively pass under the pubic arch (fig. 218).

Failure of complete flexion as a cause of non-rotation forwards, and delivery of the head by exaggerated flexion, are strictly comparable to the state of affairs in unreduced occipito-posterior positions of the vertex.

A rarer way of delivery of the head than by the process just described is by extension of the head at the perinæum. The chin hitches behind the symphysis, and the head revolves round this as a centre, the occiput, vertex, and forehead successively passing over the perinæum (fig. 219). This mechanism can happen with a small head only, and is no doubt caused by flexion being even more deficient than in the case of the other manner of delivery in unreduced sacro-posterior positions. It is, in fact, an inverted face mechanism.

Footling.—In this case one or both feet may be found in the vagina or at the os.

The most characteristic part of the foot is the heel, and this, on being recognised (see diagnosis of transverse lies, p. 471), will show the direction of the occiput.

If both feet come down, labour is more easy than in a full breech case until the head reaches the pelvis and meets with the resistances, at present only sufficient dilatation having been produced to allow the hips alone (*i.e.* without the legs doubled on them) and the shoulders to pass. The head has therefore to dilate the passages under very unfavourable circumstances, and help is almost bound to be necessary. Except for this, the mechanism is that of ordinary breech cases.

If one foot only presents there is a slight difference. The foot which is down is guided by the pelvic floor to the front, turning the trunk round with it, so that the side to which it belongs comes to the front. If, for instance, the child is in the right sacro-posterior (third) position and the left leg is extended, this leg, which is at first behind, rotates to the front, and the child is born as if it had been originally in the first or fourth position.

Similarly, a left sacro-posterior position is converted by the descent of the right leg into a case with the sacrum to the right.

This fact is of some importance to remember in choosing the leg to be seized in turning in the case of contracted pelvis (see p. 442). The movements of the child will be easily remembered, if it be borne in mind that the back of the child turns to that side of the mother which has the same name, left or right, as the leg that is brought down.

The half-breech dilates the cervix in this case, and is a better dilator than the hips alone, though not so good as the full breech.

Knee Presentations.—The mechanism in these cases is the same as that in footlings, as soon as the knees have been born and extended.

Moulding of the Head in the Podalic Lies. *Formation of 'Caput.'*—The 'caput' is formed on that buttock which is anterior throughout, or

during the passage of the breech through the vagina. The tissues of the scrotum are often much distended with serum, and sometimes extravasation of blood occurs. The vulva in female children is affected, but to a less degree.

The head passes through the pelvis in the same relative (but inverted) positions as in vertex cases ; but the vault is not pressed on by the uterus in breech cases to the same extent as it is by the pelvic floor in vertex presentations, and so the suboccipito-frontal and suboccipito-bregmatic diameters are not reduced to any extent. The latter is, indeed, occasionally somewhat lengthened.

The fronto-occipital diameter is shortened conspicuously, and the head becomes somewhat dome-shaped (fig. 220).

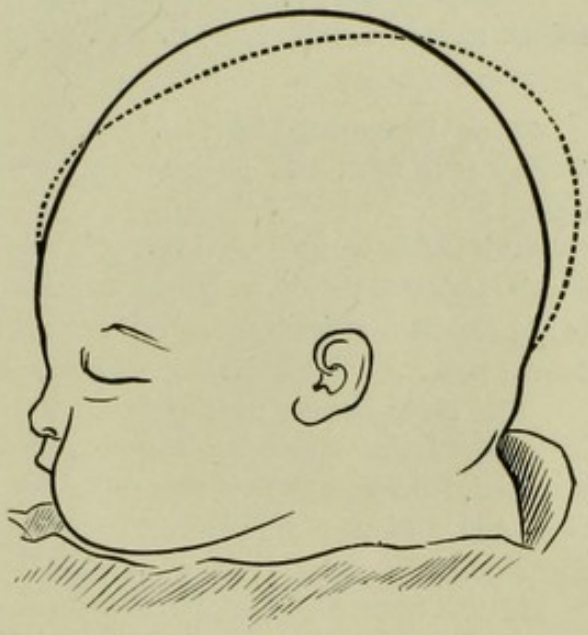

Fig. 220.—Head-moulding in a breech case. The dotted line shows the natural shape of the head.

In children born alive there can be but little moulding. All that occurs must take place in the pelvis, for the child cannot remain with the shoulders born and the head on the perinæum for more than a very short time, or asphyxia will be produced by pressure of the vulvar ring on the umbilical cord.

Prognosis in Cases of Longitudinal Lie

To make a standard with which the prognosis in each of the presentations we have now considered may be compared, the prognosis of the **first vertex** (left occipito-anterior) may be taken as absolutely good so far as mechanism alone is concerned. The **second vertex** and **normally ending third** and **fourth positions** may practically be put on the same footing. The other presentations have in their mechanism elements, some intrinsic, others adventitious, which modify the prognosis, either for mother or fœtus or for both.

Vertex, Third and Fourth, unreduced.—The head passes more slowly through the pelvis, owing to the greater resistance it offers to moulding in the diameters involved ; and, if the absence of flexion is due to slight contraction of the conjugate, this will also retard its progress while the brim is being passed. The soft parts of the pelvic canal are thus pressed upon for longer than usual, and their vitality is endangered.

The fronto-occipital diameter distends the perinæum, and makes rupture probable in multiparæ, and certain in primiparæ.

In consequence of damage to the soft parts of the pelvis and the perinæum, there is increased risk of septic absorption, and this may be

favoured also by the greater amount of manipulation of the genital tract necessitated by the malposition (see p. 197).

The prognosis for the child is but little affected, unless the failure to rotate causes a very long detention and long pressure on the head.

Face Presentations.—In a face presentation of any position although it may end with the chin forwards the prognosis is not so good as in vertex cases.

Labour is longer (see p. 156), and, being carried on with more difficulty, small abnormalities, such as uterine inertia or muscular weakness, readily bring about a stoppage of labour, and render help—which means, in most cases, internal manipulation of some kind—necessary.

The child has its neck much extended, and the vessels and other structures in front of the spine stretched and possibly damaged. This effect is most marked, however, when the chin does not rotate forwards, and the front of the neck and the chin have to accommodate themselves to the concavity of the sacrum (see fig. 198, p. 164).

In the unreduced cases the mother runs risks from the arrest of labour which must occur, and all the results of prolonged labour, constitutional and local, may ensue (p. 408). Here again the necessary introduction of the hand or instruments adds to the danger.

Prolapse of the cord (see p. 514) may endanger the fœtus in any position of the face.

Brow Presentations.—The prognosis is distinctly bad here; that is, of course, in those cases where conversion into a face or a vertex does not take place. The woman is open to all the results of prolonged labour, and the effects of manipulation and the use of instruments needed to reduce the size of the head (craniotomy).

If delivery occurs without any help, as it may rarely do with a small child and vigorous uterus, the perinæum is certain to be freely lacerated.

The fœtal head must be considerably compressed during its descent, and the nervous centres may be permanently damaged even if delivery be possible without perforation.

Brow cases with the chin backwards are the most unfavourable of this group.

Pelvic Presentations.—The mother's chances are not affected on account of the podalic lie, except that in primiparæ, if the trunk has passed through the canal too rapidly, the latter may not be sufficiently dilated to allow the head to pass without some laceration.

The child is, however, in considerable danger if all does not go very well as the head reaches the perinæum. For then the uterus is empty of all but the placenta and a section of the head, and is contracting strongly on this, and cutting off the supply of oxygenated blood to the fœtus. The placenta may even be detached by this time, partially or entirely. The cord is being compressed between the head and the parturient canal. Asphyxia is thus produced; and as the cold air is stimulating the surface of the child's

body, the chances are that attempts at respiration will be made, and the child in its gasps will suck mucus, liquor amnii, and blood into its trachea and lungs, and speedily suffocate unless the head is rapidly extracted.

In breech cases, too, prolapse of the cord (see p. 514) is more common than in vertex presentations, owing to the imperfect fit between the breech and the lower uterine segment.

In third and fourth unreduced breech mechanisms, the delay in delivery of the head is necessarily greater, and the prognosis for the child proportionately worse. The sterno-mastoid muscle of the child is occasionally damaged and a hæmatoma is produced (see p. 581).

MANAGEMENT OF LABOUR

CHAPTER XXII

GENERAL PRINCIPLES OF MANAGEMENT

IN the management of all cases of labour there are two essential functions which the medical man has to discharge—namely, that of assisting the woman where necessary during the actual processes of labour, and that of protecting her from any infection which might be imported from without.

He will assist to prevent—

1. Undue prolongation or complete arrest of labour from any cause, maternal or fœtal.
2. Accidents during labour, such as hæmorrhages and lacerations.
3. Retention of any part of the ovum.
4. The spread of septic or specific (*e.g.* gonorrhœal) inflammations into the deeper parts of the genital tract.
5. Accidents to the child.

He will protect the woman from—

1. Septic diseases. All sepsis is imported from without, either by air—as in hospitals where there are suppurating wounds, by the hands of the doctor or nurse, or by instruments.
2. Specific fevers, such as scarlatina, and others.

In performing these duties there is another matter to be attended to, namely, the accomplishment of the labour with as little pain and discomfort as possible: this will include the use of anæsthetics, and the care of a number of small details, which often in the patient's eyes constitute the most important part of the matter.

It may be said with perfect truth that the course of events, as far as the ultimate result to the woman is concerned, is, in an overwhelming number of cases, in the hands of her medical attendant and her nurse.

Sanitary Arrangements of the House.—The house in which a woman is about to be confined should be ascertained to be as free from defects as regards drains and the arrangement of water-supply as can be managed at the present day. The possibility of sewer-gas finding its way into the lying-in room by means of water-closets or sinks must be carefully investigated. That contamination of the air by this gas is a real source of illness there is no doubt whatever, and this is well shown by a series of

cases published by Playfair. It has not, however, been shown to produce septicæmia, though opinions on this point differ. It certainly may depress a patient and make her ill, and should therefore be strictly guarded against.

The bedroom in which the labour is to take place, and in which the patient will remain during the greater part of the lying-in period, should be as large and airy as possible, as a large room is more easily ventilated without draughts than a small one. It should also be well lighted, and not have its windows looking on to a blank wall, both for the sake of the patient and the doctor; for patients undoubtedly convalesce better in the light than in the depressing influence of a dim, semi-obscure room, and the medical man wants as much light as can be had, so as to observe his patient accurately. The temperature should be kept at 60° to 65° Fah., and free ventilation should be insured. If the woman is nervous and sleeps badly, a quiet room is essential.

If it can be obtained, another room in communication with the lying-in room is useful, as the baby may be washed and attended to in it, and the many necessary preparations made of douches, food, and so on. The nurse can sleep there for a few nights, and the medical man, if he is obliged to stay in the house for many hours, can be within call, and yet not be too much in evidence when he is not actually wanted. The patient can after some days be removed into this room occasionally for a change.

The bed should be hard enough not to form a pit where the patient lies, and really the harder it is during labour the better. A feather bed is out of the question. A rather narrow bed is desirable, so that both sides of the patient can be easily got at, and anæsthetics, if needed, can be more easily given. A wide bed is perhaps more comfortable after labour, for the patient can change her position sometimes, and move from one side of the bed to the other before she is able to be moved off it altogether.

A mackintosh sheet, over which a draw-sheet is arranged, must be placed under the woman, and it is a great advantage to have over this a square cushion made of absorbent wool, which can be burnt after it is soiled with discharges.[1] It will be found useful to have two such squares, or even more, in case the second stage is a prolonged one.

Antiseptic Measures

The principles of asepsis in the case of midwifery are identical with those governing the practice of surgery.

We owe the beginnings of our present knowledge of their paramount importance in midwifery to Semmelweis of Vienna. In 1847, while he was in charge of one of the lying-in wards of the General Hospital at Vienna, he found a terrific mortality—namely, one of about 12 per cent.—among the women treated there. The death of a colleague from a poisoned dissection wound suggested to him the probability that students coming straight from the dissecting-room, with hands only hastily washed in soap and water, were the carriers of poison of a similar kind, and that they probably inoculated the patients when they made vaginal examinations.

[1] Such squares of tissue, measuring 32 in. by 32 in., are to be obtained from the Sanitary Wood Wool Company.

He issued orders that any person about to examine a patient should, after washing his hands, rinse them thoroughly in chlorine water, or in chloride of lime solution. The mortality of 12·24 in the May of this year went down to 3·04 per cent. in the months following to December. A case of cancer of the uterus in a parturient woman was admitted during this period, and of twelve patients examined immediately after she had been examined, all died of septicæmia but one; and a case of caries of the knee caused eight fatal cases.

Semmelweis came to the conclusion that 'not particles from dead bodies alone, but any material in a state of decomposition proceeding from living organisms; even air, contaminated from such sources, may generate symptoms of puerperal fever. Scrupulous attention to the use of disinfectants, combined with separation of patients affected with the disease,' brought the death-rate down to 1·27 per cent.[1]

The mortality in lying-in hospitals has until recently been far in excess of that in private cases, and the most marked triumph of the use of antiseptic measures has occurred in such institutions.

In the history of the General Lying-in Hospital there are accounts of epidemics of 'puerperal fever in which the death-rate was an awful one; 19 out of 71 in the year 1838, 9 out of 63 in 1887, and cases of septicæmia were nearly always occurring.'[2] Cullingworth finds the total mortality of the hospital from 1838 to 1860 to have been 3·085 per cent., declining to 1·6 per cent. in the period 1861 to 1877, and to 0·618 per cent. in the years 1880 to 1887 inclusive.

Antiseptic measures are to be credited with the saving of very nearly all the lives indicated by the differences in this series of percentages.

If the principles of aseptic midwifery could be perfectly carried out, there should be no deaths from septicæmia, and, what is more, no illness. The unavoidable deaths in childbed, which are caused by other abnormalities than septicæmia, may be taken as about ·2 per cent., and this at present is the ideal death-rate.[3]

Stress is to be laid on *morbility* as distinct from *mortality*. That a patient may be very ill from septicæmia, and yet not die, is obvious, and such cases would not be included in a death-rate. The women who survive such illnesses are infinitely more numerous than those which succumb, and hence the importance of this group. Many of them are rendered invalids for long periods, or possibly for the whole of their lives, by the disease which occurs at the time of child-birth.

It is, therefore, satisfactory to know that the morbility has diminished to

[1] Duka. [2] Cullingworth.

[3] Septicæmia is shown to be practically controllable by the following facts. For five years there has been no case of septic disease in the General Lying-in Hospital unless the patient has come in already infected. In consequence of, and proving this, only 3·3 per cent. of the patients were obliged to be kept in the hospital longer than fourteen days after labour. During the year 1895 only one case died of 535 admitted, and this fatal case was moribund from ruptured vagina and exhaustion on admission. The 535 cases included 25 cases of contracted pelvis admitted for induction of labour, and other abnormal labours in a far larger proportion than would have occurred in any 535 cases taken from general sources.

a greater extent even than the mortality, and that this is entirely owing to the antiseptic treatment of labour.

The influence of the antiseptic method is not confined, however, to the prevention of septic processes alone; but, taking it in its broadest sense, it is equally applicable to other infectious diseases which are liable to attack the lying-in woman. This part of the subject will be more fully dealt with in the chapters dealing with the puerperal fevers (p. 525).

Antiseptic Method.—The medical man, in deciding, as he must do in bare justice to his patient, to conduct labour on antiseptic principles, should determine exactly his line of action.

There are two very important points to bear in mind. First, the *details must be as simple as possible*, for they will have to be carried out mainly by the nurse, and complicated directions may possibly lead to the neglect of all principles and details together. Second, as *antiseptic materials* (including soap) will have to be used, only those should be employed on the same case as are *compatible with one another*, for it is found that some of those in more common use cause mutual decomposition, and both are thus rendered useless. Impromptu combinations are therefore undesirable, unless the user is well acquainted with the chemical characters of his materials.

Soap decomposes perchloride of mercury, iodine, and permanganate of potash; but, of course, excess of a solution of any of these drugs will prevent any appreciable interference with their action. Carbolic acid and permanganate of potash are incompatible. Carbolic acid can be used with soap without decomposition occurring.

The following table, copied from Boxall,[1] shows these characters[2]:

—	Perchloride of Mercury	Carbolic acid	Iodine	Salicylic acid	Pot. Permang.	Olive Oil	Vaseline	Glycerine	Soap
Perchloride of mercury	—	—	x	—	—	—	—	—	x
Carbolic acid sol.	—	—	x	—	x	x	—	—	—
Iodine sol. (in iodide of potassium)	x	x	—	—	—	—	—	—	x
Salicylic acid sol.	—	—	—	—	x	—	—	—	x
Potassium permanganate	—	x	—	x	—	x	—	x	x

The absolutely necessary part of aseptic midwifery is **cleanliness**. Without this the use of antiseptic drugs is of little or no advantage, and any good that may accrue from their employment apart from cleanliness is more than neutralised by the false security produced in the mind of those in charge of a case.

In the majority of labours cleanliness is probably all that is needed; but the possibility of the existence of infective material on the hands of the

[1] 'Fever in Childbed,' *Obstet. Trans.* vol. 32, p. 279.

[2] An x shows incompatibility.

medical man or nurse which cannot be entirely removed by simple washing makes it advisable to use some antiseptic to destroy such matter.

The following directions may be considered to include what is essential in the greatest number of cases.

Essentials.– The first and most important point to be observed is that the hands shall be germ-free. This holds good of the medical man and the nurse equally ; and while compelling the nurse to adopt stringent rules on this point, the doctor must not think that he is exempt, and can without danger employ an unwashed finger to examine his patient.

The hands and especially the nails should be carefully brushed with hot soap and water and then placed for a quarter of a minute in some antiseptic solution, the best being a 1–1000 solution of corrosive sublimate, in all cases before the genitals are touched. This process must be repeated each time an examination or manipulation has to be made.

A basin containing enough sublimate solution to completely cover the hands when immersed must always be kept ready for use. This solution is to be kept at the bedside and renewed occasionally during labour, and once a day during the lying-in period.

The external genitals and their neighbourhood must be washed well with soap and water before labour, and then swabbed over with a 1–1000 sublimate or 1–40 carbolic solution. This washing of the external parts is most important, and must be repeated daily during the puerperium. It is advisable not to use an ordinary sponge for this purpose, but a piece of absorbent wool or an artificial sponge, which must be burnt after use.

All catheters and vaginal tubes must be washed before and after use, and then placed in an antiseptic solution for a few minutes ; it is better to keep them in such a solution at all times when they are not in use. Mackintosh sheets and bed-pans must be washed and rinsed with the solution before and after each time of use.

Everything absorbent that becomes contaminated with blood or secretions must be at once removed from the room, and if of wool or wood-wool, burnt.

For lubricating the fingers before an examination per vaginam, a solution of sublimate (1–1000) or carbolic acid (1–40) in glycerine is the best material. Vaseline is not good, although it may be convenient, since it is impossible to make it aseptic, and it is difficult to wash it off. Animal fats and oils are dangerous. The sublimate solution cannot be used for lubricating metal instruments, as mercury is deposited on them, so that where forceps are employed, carbolised glycerine is the more useful of the two ; or a combination of pure soft soap and carbolic acid (5 per cent.) is convenient and safe.

When antiseptic solutions are prepared for use by diluting stronger stock solutions, or by dissolving solid substances, no guessing at quantities is to be permitted ; everything must be measured. It is safer and much more convenient in private work to use as far as possible solid tabloids made to contain enough of the drug, say of sublimate, to make a solution of a given strength by dissolving one or more in a certain quantity of water.

The nurse should be instructed to arrange three basins on the table in

the lying-in room : one in which the hands are washed with soap and water ; a second containing the 1–1000 solution in which they are dipped ; and a third containing a similar solution, in which the catheter and douche-tube are constantly kept. If it is considered advisable to use vaginal douches, the occasions for which will be mentioned as they arise, an irrigator is better than a Higgenson's syringe. Irrigators are now in almost universal use, for they save the trouble of pumping, they can be easily used by the woman herself in almost any attitude, and, as they act merely by gravity, they supply a constant stream instead of the intermittent one of the syringe. There is in the use of the irrigator much less chance of forcing air into the genital passages, and a source of danger is thus avoided. The syringe also, when it is in 'diastole,' draws fluid back through its nozzle as well as from the vessel containing the solution, and small clots and other débris get sucked back into the vaginal tube ; these may decompose, and be subsequently injected into the vagina, or, at any rate, they block up the holes in the end of the nozzle.

Two quarts is a suitable quantity of solution for a douche. The douche-tin should be hung about three feet above the level of the patient.

The strength must vary in different cases. If there is no special indication for an extra strong solution, about 1–5000 sublimate or 1–60 carbolic acid is quite enough. (See p. 526, Septicæmia, &c.) The whole question of the necessity for systematic douching is discussed in the chapter on the Management of the Puerperal Period.

Some weeks before the expected labour the mother or the nurse should be supplied by the physician with a list of the articles and drugs which he will require, and they must be kept in readiness. The list found at the bottom of this page will be found to contain all necessaries, and it may be modified according to the tastes of the individual medical man.

The first summons to the case must always be obeyed at once, for, in addition to affording mental relief to the woman by his presence, the medical man can make an approximate, or possibly an exact, diagnosis of the kind of labour likely to take place. If there is any malpresentation or other abnormality, he will be in the best position to rectify it at an early stage of labour, or he can at all events prepare to encounter it. He may, by delaying, allow a transverse presentation to become impacted, for instance ; or the patient and her uterus to become tired out in a case of contracted pelvis ; or he may lose his patient from hæmorrhage.

List of Special Requisites

Four dozen wood-wool 'towelettes,' large size.

Two or three wood-wool sheets, 32 × 32 in. The wood-wool may, with advantage, be impregnated with sublimate.

Four binders, made of huckaback towelling, 36 in. wide and 1¼ yard long.

Large pins for securing the binder.

Gum-elastic (male) catheter, No. 8.

A 1–1000 solution of hydrarg. perchlor. in glycerine; 4 oz. in wide-mouthed, glass-stoppered bottle.

Tabloids of hydrarg. perchlor. or 'iodic hydrarg.' to make solutions.

Chloroform, 4 oz.

A douche-tin, 2-quart size.

CHAPTER XXIII

MANAGEMENT OF THE FIRST STAGE OF LABOUR

ON the arrival of the medical man he has to make out whether the woman is in labour or not, and if the labour is so far normal.

The diagnosis of the commencement of labour has been dealt with in the chapters on the Progress of Labour, and the possible fallacies pointed out.

If the pains which suggest to the woman the need of assistance are due to irregularity of the bowels a dose of some purgative must be given, unless the bowels have been recently quite satisfactorily opened. In this case a sedative, such as 5 to 6 drops of Tr. Opii, is likely to be of most service.

If it is clear that labour has not begun, the lie of the fœtus should be made out by abdominal examination, and if it is one of the normal lies, the patient may be left.

If, on the other hand, *labour has set in seriously*, it will have to be decided whether it is safe to leave the patient, and if so, for how long.

The points to take into consideration are: whether the woman is a primipara or a multipara; the amount of shortening or of dilation of the cervix already attained, and the dilatability of the cervix; the history of previous labours, if there have been any; regularity of the pains. The average durations of labour in different classes of parturient women have been already compared; they may be here recapitulated.

	First	Second	Total
Multiparæ	8	1–2	10 hours
Primiparæ	16	3–4	20 „
Elderly primiparæ (over twenty-six)	20	4–5	24 „

To avoid discussing in full every possible combination of conditions, two cases may be taken.

Suppose a young primipara has begun the first stage and her cervix is nearly obliterated; the pains are regular, say every ten minutes or so; she may, as a rule, be left for three or four hours with safety, if all is going on normally.

A multipara with a history of rapid labours, and with easily dilatable passages, with the membranes bulging through the internal os, and with regular pains, should not be left at all.

Between these two extremes each case must be judged on its merits and by the light of personal experience, remembering always that it is better to stay too long and come too often than to be out of the way at the critical moment.

After making out as completely as possible by abdominal examination the lie and position of the child, the physician must ascertain the state of the genital passages, and especially that of the cervix, by vaginal examination.

The woman is to be made to lie on her left side quite at the edge of the bed, and to draw up her knees. This attitude is almost universal in Great

Britain, and is known abroad as the 'English position.' The advantages over the dorsal one, which is used on the Continent, are that all necessary manipulations can be carried on at the edge of the bed within convenient reach, without disturbing the woman more than is necessary ; she does not see what is happening, or how much she is exposed. A disadvantage is that the uterus is deprived of the assistance of gravity in expelling the child. In case of there being marked anteversion of the uterus, the lateral position does not correct this, and the dorsal one does. These objections are, however, comparatively unimportant, and are more than counterbalanced in ordinary cases by the advantages of the left lateral position. (During the stage of dilation the patient need not remain in this position longer than is necessary for examination.)

The first examination should be made during a pain, for the woman is not at that time so much alive to the discomfort that may be caused, being otherwise occupied.

The bladder should be empty ; at this stage the woman is able as a rule to pass water without the aid of a catheter. The rectum must also be cleared by an enema, if necessary.

At the beginning of his experience the student will find some difficulty in remembering the altered relation of the various diameters to the horizon brought about by the lateral position of the patient ; but the difficulty will soon be got over, and the diagrams illustrating the various positions will help in this particular.

The right forefinger, made aseptic and lubricated, is passed into the vagina and up to the cervix. The cervix is not always easy for a beginner to find, it is sometimes so very soft, especially in primiparæ, and so slippery. The fœtal head is often bulging the anterior vaginal wall forwards and downwards, thus concealing the cervix above and behind it (see fig. 61) ; and the anterior uterine and vaginal walls may be very thin, and closely resemble the bag of membranes.

The parts should be handled very gently so as to avoid rupturing the membranes, if these are protruding, or abrading the surfaces of the cervix and vagina.

The vagina is found to be well lubricated with mucus from the cervix if labour is proceeding normally, and the freedom of the genital tract from cicatrices or other obstructions (e.g. pelvic deformities) should be noted.

If a pain is present when the cervix is touched, the exact amount of dilation can be made out, since the membranes bulge through the opening and define it completely. In a primipara, if the membranes have not yet reached the external os, the amount of real shortening will be estimated. (see p. 110).

The edge of the distended os in 1-paræ and in multiparæ respectively has been described. A soft thick edge in a primipara means, as a rule, rapid and safe dilation. The edge is often thin at first, and may thicken afterwards to a variable degree.

If any difficulty arise in reaching the cervix on account of bulging of the anterior uterine wall, the patient should be put on her back and the cervix brought forward by pushing the fundus backwards with the other hand laid on the abdomen.

If no effect is produced on the membranes by pains, and no dilatation of the os occurs at the moment of one, the pains are of no use, and are either 'false pains'—that is, merely a colic of the uterus—or their failure to advance labour is due to one of the causes described in the section treating of abnormalities of labour.

If slight dilation has taken place, the failure to bulge on the part of the membranes during a pain may be due to adhesions of the membranes round the internal os, and this can be remedied by detaching them from the uterine wall by passing the finger round the circumference of the os.

The presentation should now be completely made out ; and if a vertex, face, or breech is found at the os, one cause of delay in labour—namely, a transverse lie—is excluded. This will, however, have been done in almost every case by the previous abdominal examination. If a pain be present, or comes on while the diagnosis is being made, and the membranes bulge and become tense, the examining finger should remain in contact with the cervix, but quite still, for fear of rupturing the membranes. When the pain goes off the presenting part can be identified.

If any doubt as to the roominess of the pelvis is now suggested by the woman's stature or appearance, or by the history of previous labours, an estimate of the conjugate measurement, and of other measurements if necessary, must, if the pelvis has not been already measured, be made at this time. (For indications and method of examination, see p. 415.)

All the above data—namely, the presentation, the formation of the bag of membranes, the amount of dilation, the permeability of the parturient canal, and the condition of the rectum—should be obtained at one examination if possible, and the patient left alone until the membranes rupture, if this occurs within a reasonable time. Frequent examinations afford no fresh information, and they irritate the patient. They tend in some cases, too, to cause spasm of the cervix, and thus to actually retard labour.

The woman should not lie down until nearly the end of this stage of labour, but she should rest when necessary in a chair. Her uterus thus continues to be assisted by the action of gravity.

There is no need for the medical man to remain constantly in the room during the dilation of the cervix, if this is going on normally ; and the pains will go on all the better for his absence.

A careful examination should be made to see if there is any *purulent vaginal discharge*. If this is present, a douche of 1–2000 solution of corrosive sublimate should be given, both to prevent the secretion from being carried within the internal os by the finger, and thus causing infection of the interior of the uterus, tubes, and peritoneum, or the inoculation of abrasions ; and to prevent infection of the eyes of the child as it descends through the vagina. This douche must be repeated if the first stage is unusually long. Instead of corrosive sublimate, which has been found at the General Lying-in Hospital to tend in primiparæ to cause rigidity of the perinæum and a greater tendency to rupture, a solution of carbolic acid may be used.

As the pains usually increase in frequency just before the end of the first stage, this sign will suggest the necessity of the patient's lying on the bed at short intervals, so as to be prepared for rupture of the membranes. She should lie on her back, and have an absorbent sheet and a mackintosh beneath her.

The condition of the bladder must receive attention ; a full bladder is a frequent cause of delay in the expansion of the cervix. If there is any retention of urine on account of an already low position of the head in the pelvis, causing pressure on the urethra, a catheter should be passed. A No. 8 male gum-elastic one is the best.

Passage of a catheter.—In passing a catheter at this stage, and at all times in future, care must be taken that there is no vaginal discharge at the urethral orifice to be carried into the bladder by the instrument, for the septic organisms thus imported frequently cause cystitis.

The vulva, which has already been well washed with soap and water, should be swabbed with a 1–2000 solution of sublimate or its equivalent in carbolic acid or other antiseptic immediately before catheterism ; the catheter and the hands will of course have been made aseptic previously. The altered direction of the urethra at this stage must be remembered (pp. 116 and 117).

When, taking the average length of the first stage, the time has arrived at which the os may be expected to be fully dilated ; or if the pains have become very frequent, and yet no gush of liquor amnii has shown that the waters have broken, an examination should be made, and if the os is found fully dilated (see p. 113), *the membranes should be artificially ruptured.* The disadvantages of delayed rupture have been explained (p. 115). Care must be taken not to rupture them before full, or nearly full, dilation has taken place, for reasons given at the same place.

Rupture should be accomplished by scratching through the membranes with the nail while a pain is rendering them tense. If they are too tough for this, a sound, or the stilet (aseptic) of a catheter, may be used with great care.

As on rupture the fore-waters will be at once discharged, a vulcanite or porcelain tray should be placed to catch them. Any abnormality, such as the presence of meconium or discolouration, can then be noticed (see p. 29), and the bed is kept dry. The quantity, too, is of importance ; an unusually large quantity, say over half a pint, suggests that the presenting part is not filling the os, and that it may be a breech, or a shoulder, or there may be some contraction of the brim.

The child's heart is now to be listened for per abdomen at intervals, to ascertain if it is alive and vigorous, or if there is need for rapid delivery.

Immediately after the membranes have ruptured, an examination must be made per vaginam, so as to accurately diagnose the presentation, if this has not been already accomplished, and to be ready to deal with any abnormality that may be found.

CHAPTER XXIV

MANAGEMENT OF THE SECOND AND THIRD STAGES OF LABOUR

Second Stage

The woman should now lie down all the time; not necessarily on her left side, except when an examination is to be made or when the head is on the perinæum. An arrangement for helping the patient in her bearing-down efforts can be made by letting her lie so that her feet are flat against the foot of the bed, and giving her a towel fastened to the foot-rails to pull upon.

The pains are probably by this time causing enough suffering, especially in a primipara, to make a little *chloroform* welcome, and this will by diminishing the suffering induce the patient to bear down more freely (see chapter on Anæsthetics). The anæsthetic is only to be given when a pain is beginning, and to a very slight degree.

Note is being taken of the steady advance of the presenting part at each examination, and of the particular mechanism in action.

If the anterior lip is pushed down in front of the head, it should be reduced by gentle pressure upwards during a pain as soon as diagnosed; for if allowed to remain it soon becomes œdematous, and may cause delay; besides this it is liable to be damaged itself, and becomes a cultivation-ground for septic organisms.

As long as labour is found to be progressing, although it may seem slowly, there must be no interference; and further examination must not be made until the head reaches the perinæum, unless another douche is needed on account of the accumulation of more purulent discharge in the vagina.

When the perinæum is distended and the anus dilates, the effect of each pain on the perinæum must be carefully observed, and the physician, remembering the change of direction now occurring in the path of the head (p. 116), must be ready to assist the floor of the pelvis in effecting this change, if the occiput does not seem to be taking full advantage of the space under the pubic arch. He may therefore during each pain lay his left hand with its palm flat on the perinæum, making it in fact a second layer of pelvic floor, and tending to push the head forward under the pubic arch. Great care must be taken in doing this not to begin to push too soon, as by doing so the head is not allowed to protrude sufficiently to place the angle at the nape of the neck in relation to the under surface of the symphysis. If this does not take place, the vulvar orifice is stretched by a diameter near the occipito-frontal, rather than by the smaller suboccipito-frontal (see figs. 221 and 222), and more harm is done than good. So that the perinæum had better be left to take its chance than be interfered with unskilfully. There was formerly great difference of opinion as to whether the perinæum should be supported or whether it should not, and each side was able to bring forward statistics to show that their view was the correct one. Some solution of the difficulty

will probably be found in the above explanation of the disadvantage of premature and the advantage of timely support.

The left hand is to be laid over the perinæum with the thumb extended, and the radial border corresponding roughly to about where the coronal suture is judged to lie—that is, a little behind the anus.

The head should be allowed to bulge the perinæum freely as long as there is only slight dilation of the vulva, for the gradual stretching and relaxation thus obtained tend to avert laceration. When the posterior part of the pelvic floor becomes an active agent in expulsion—that is, when the bi-parietal diameter is through the posterior rings of the contractile tube—the head, according to the principle just mentioned of allowing the nape of the neck to reach the edge of the symphysis, should be gently pushed forward. As more and more of the head is extruded and the critical circumference, the suboccipito-frontal (which, it will be remembered, nearly cuts the

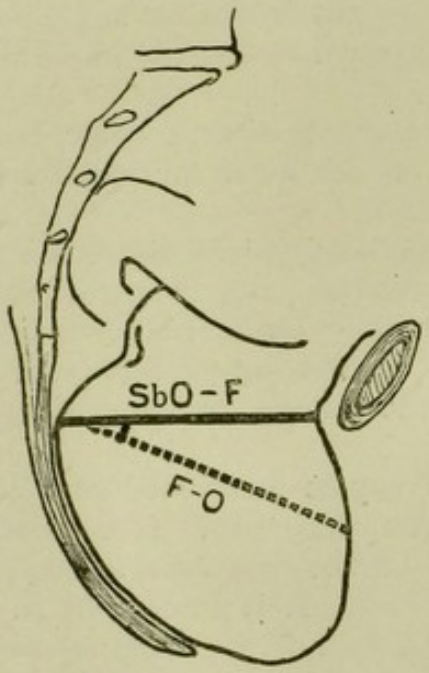

Fig. 221. Correct.

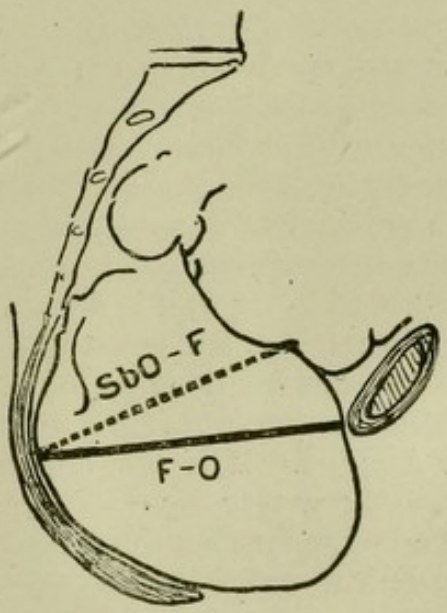

Fig. 222. Incorrect.

SbO F, suboccipito-frontal diameter; *FO*, fronto-occipital diameter.

parietal tuberosities), comes to occupy the vulva, the woman, if not under an anæsthetic, must be told not to bear down more than she can help during the pains, but to cry out and thus relieve the perinæum. The too rapid advance of the head can be regulated by the right hand, the fingers of which are to be laid for this purpose over the occiput.

In the intervals of pains an attempt should now be made to *squeeze the forehead over the perinæum edge.* This passage will be made during an interval with less chance of laceration than during a pain, for the muscles of the pelvic floor are relaxed.

When the head seems to be completely born, it should be made out that the chin has cleared the perinæum, and if it has not, it should be extricated by gently pushing the edge of the latter backward on to the neck.

In primiparæ *laceration of the vaginal orifice* (the base of the hymen) practically always occurs, and the laceration may vary in depth and in superficial extent. Usually the tear is continued on across the fossa navicularis to

the fourchette, and then makes itself evident on the surface. In slight cases of laceration the bottom of the fossa may escape, and the laceration may involve the base of the hymen and the fourchette only. It is quite exceptional for the latter to escape.

The tearing, if slight, is done by the suboccipito-frontal diameter only, but it may be begun by earlier diameters, and will then be extended by the passage of the largest distending diameter. Severer lacerations will be considered later. The object of assisting the pelvic floor in the way just described is to minimise the tears which are liable to occur.

When the patient is anæsthetised the physician has more control over the movements of the head, since the abdominal muscles do not contract so violently during the pains, and in the intervals the perinæal structures are relaxed. It is therefore advisable, in all cases where the perinæum is likely to be inelastic as in elderly primiparæ, or when the perinæum is rigid from cicatrices, or unusually long, or where the patient is unable to exercise a moderate amount of self-control, to give chloroform to remedy more or less completely these drawbacks.

Local applications to the perinæum are probably of little value, but hot fomentations and inunction of grease or oil of some kind have been recommended and are practised by many.

Stretching the perinæum digitally while the head is still above the level of the pelvic floor may possibly be of some service ; but it is not easy to satisfy one's self that much advantage has been gained. If, however, it is thought well to try it, it is done during a pain by hooking the forefinger over the perinæal edge and stretching it towards the sacrum occasionally. If it be not too roughly done no harm accrues.

There is one procedure which, however, may be mentioned as a thing to be avoided. It is the operation known as *episiotomy*. It consists in anticipating a tear by making an incision or two incisions through the perinæal edge for about three-quarters of an inch. It is said by those who advocate it that this clean incision heals better than the expected laceration. The cut is to be made backwards and outwards from one side of the fourchette towards the tuber ischii of the same side, and one cut may be made ; or two, one on each side. This will possibly enable the head to pass the vulva more rapidly, but this is all that can be said for it. On the other hand, it is in the first place never certain that laceration will occur at all, and the cuts may be useless, and, what is more, afford an entrance to septic matter. In the second place, laceration may occur, even when episiotomy has been done. In the third place, a tear made by the head, if properly sutured, heals most satisfactorily, even when it extends into the rectum, and in these severer cases episiotomy would be useless. It is therefore not to be recommended under any circumstances, unless a dense cicatricial condition of the perinæum is found, when possibly some harm might be averted by a central incision carried as far as the sphincter, if necessary Such a cut ensures the greater part of the tear being made through the middle line, where there are fewest vessels.

When the head is born the neck should be examined to see if there is a *loop of cord* round it. If one is found, or there may sometimes be two turns, a little more cord may be pulled down and the loop slipped over the head.

If the cord is too tight to be pulled down, the loop may be passed over the shoulders as they emerge, and if this is impossible, it must be divided and tied, or a clip put on each divided end until the child is delivered. If labour be allowed to go on with the cord round the neck, the child may be strangled by the loop, or the placenta may be detached, and in any case the delivery of the shoulders is delayed.

The right knee may now be raised by the nurse, so as to afford more room for the occiput to travel up in front of the symphysis. As the shoulders emerge the perinæum must be watched, and the uterus should be followed down by the left hand on the abdomen very carefully, if there seems to be any tendency to relaxation.

Occasionally there is a little delay in the passage of the shoulders owing to the resilience of the perinæum, and the child gets blue in the face. In this case the head should not be forcibly pulled upon to the danger of the neck, but the neck should be pushed against the perinæum to allow the anterior shoulder to come down. The shoulders can then be extracted by passing a finger under the posterior axilla (see fig. 361). As a rule, however, it is better to express the fœtus by the hand laid on the abdomen, unless there is need for hurry. There is no great danger in congestion of the head if this is not allowed to continue for more than one or two pains.

The child is now partly lifted, partly guided on to the bed, where we may leave it for the present, having seen that it begins to cry and to breathe satisfactorily. Its eyes should receive attention at this moment (see p. 240).

Third Stage

The third stage should receive the most careful attention. On its proper management depends to a great extent the welfare of the woman in the lying-in period.

The uterus must now be carefully looked after, and light but steady pressure must be kept up until some time after the expulsion of the placenta and membranes. The nurse can relieve the medical man if his attention is needed for the child.

Tying the Cord.—It was formerly the practice to tie and divide the umbilical cord immediately after delivery, but it has been shown that by doing this the child is deprived of about three ounces of blood, which is the equivalent of about three pints in an adult. If the cord is left untied for five or six minutes, these three ounces of blood are allowed to flow in from the placenta. The forces bringing this about are the aspiration caused by the filling of the child's lungs, and the new pulmonary circulation (see p. 236); the slight compression of the placenta as the uterus retracts and contracts; and the gravitation of the blood towards the child as it lies on the level of the bed.

The time to tie the cord is when the umbilical vein collapses, or a rougher test is by observing when the pulsations in the cord have nearly ceased. If complete cessation of pulsation is awaited, there will be no harm done; but it is unnecessary to do this, for the arteries can be felt beating for some time after all the blood which the child will gain has passed into its body.

Children who obtain the amount of blood above mentioned are found to be more vigorous during the first few days than children whose cords have been tied at once. The process resembles what would happen if the woman were to be unassisted, as she might be in a state of nature, for then the placenta would be expelled still attached to the child.

It has been said that jaundice follows late tying of the cord in a larger percentage of cases than occurs in those children whose cords are tied at once. That this is an *à priori* argument, founded on the idea that the excess of blood corpuscles thus finding their way into the circulation must disintegrate and by the colouring matter set free cause staining of the tissues, is shown by the observations of Schmidt,[1] who found that when the navel-string was tied at once 72 per cent. of the children were jaundiced, while in those children where ten minutes were allowed to elapse before tying only 42 per cent. were jaundiced. He also found that the most intense cases occurred where the cord was at once tied. As regards the weight of the child after a fortnight, those children whose cord was at once tied gained on an average 12·3 grammes, while those whose cord had not been tied for fifteen minutes gained 48·9 grammes. It is better not to compress the uterus while the placenta is still attached to the fœtus, nor to raise the placenta above the child if it has been expelled before ligaturing, as this might conceivably lead to the entry of undesirable material into the child's circulation.

The cord is usually tied in two places, one at about two inches from the umbilicus so as to allow of re-tying if the ligature slips, the other an inch or so nearer the placenta, and is divided between the ligatures. The second ligature is of no use except to prevent a mess, and if pulsation has ceased there will be little or no blood to run from the cut end (placental). If, however, there is a second child in the uterus the matter is different, since its vessels may communicate in the placenta with those of the first, or the two cords might be joined near the placenta. In the case of twins, then, the cord must be tied twice. In other cases it is a matter of indifference.

After the cord is divided the child is given to the nurse, who has had her hand on the uterus during this process.

If the child is not crying and breathing properly after its entire body has been born, its mouth and fauces should be carefully wiped free of all secretions, and external stimuli, such as sprinkling the chest with cold water and slapping the buttocks, should be applied. If these measures are insufficient, treatment according to the rules for reviving stillborn children must be adopted (p. 520). In cases where the mother has had a good deal of chloroform during the labour, the child is often slow in responding to the stimulus of the external air, and often requires considerable encouragement before it cries freely.

Supposing all is going on well with the child, it may be laid aside in a flannel receiver, and attention paid to the uterus. The management of the uterus must now be conducted according to the following rules :—

(1) The expulsion of the placenta and membranes from the uterus is to be effected as far as possible by uterine contractions alone. Therefore the

[1] *Archiv. f. Gyn.* vol. xlv. 1894.

placenta must under ordinary circumstances be neither forcibly expressed nor pulled out. This tends to ensure (2) and (3).

(2) The expulsion must be complete. To ascertain this, very careful examination of the placenta and membranes after expulsion must be made, with a view to find out if any portion has been left behind.

(3) Retraction is to be encouraged by attending to 1 and 2, and by carefully watching that no increase in size of the uterus takes place while it is uncontracted. This prevents post-partum hæmorrhage.

There is no need to explain in detail the rationale of these principles. The reader will at once be able to understand it if he has carefully read the chapter on Separation and Expulsion of the Placenta and Membranes, and if he understands the nature of retraction.

The uterus is to be taken in hand, as mentioned already. The palm of the left hand should support the fundus, which is now about the level of the umbilicus, and should press gently on it. The ulnar side of the hand will be above the fundus, and the thumb in front. When the uterus is felt to contract, slight pressure must be made in the axis of the brim for as long as the pain lasts, and no longer.

If more than fifteen minutes elapse before a pain appears after the end of the second stage, the uterus may be stimulated by gentle friction over that part of the abdominal wall under which it is felt, until a contraction is brought about. In case of moderately free bleeding before the first contraction occurs, this interval should be made shorter, the hand should make firm pressure in the axis of the brim, and stimulation should be repeated soon. If, however, there is little or no bleeding, the next pain must be awaited, and the gentle pressure on the fundus repeated when it occurs.

After several pains, or sometimes during the first, a pretty sudden diminution in bulk of the uterus will be evident to the hand. This means that the placenta has been expelled into the vagina.

By a little extra pressure in the same direction as before, it may be expelled almost entirely through the vulva. The afterbirth may be removed from the vagina, however, with the right hand, care being taken to get a good grip of it, and not to tear it. Simultaneous downward pressure made by the left hand will help this.

As the placenta is drawn from the vagina it should be twisted round several times, to convert the membranes into a rope, and render them less easily torn.

The left hand is on the uterus all the time, and this organ will often be felt to relax to some extent. This relaxation need cause no alarm if there is no marked enlargement of the uterus, and no bleeding, when it happens.

When it is well contracted the uterus feels about the size of a fœtal head, but its size varies in different subjects within fairly wide limits. It lies with its middle about the level of the brim, and its fundus two finger-breadths or so below the umbilicus. After a few minutes' supervision the uterus may be again given into the nurse's charge, and the placenta and membranes must be now carefully examined.

Examination of Placenta and Membranes.—To do this it is best to float them in a large basin of water. The placental edge and maternal surface should be first examined to see if any part of its tissue is missing. A lobe, or part of one, may be left behind, and the amnion to which this part was attached may come away entire.[1] Traces of placental tissue should be sought for on the maternal surface of the amnion, and it will be remembered that the presence of a pair of vessels torn through at the placental edge denotes the existence of a placenta succenturiata somewhere. If this is not found outside, it must still be in the uterus.

If the membranes have not been badly torn, the position of the hole for the passage of the fœtus will be found. The sac of the amnion and chorion can then be roughly reconstructed, and any deficiency noted. If the membranes have been badly torn, their entirety can be only approximately judged of; but if the third stage of labour has been conducted in the way just described, and if no internal manipulations have been necessary, they should be complete. Attention must be paid to the state of the chorion, as portions of this are likely to be left behind if the cohesion between this membrane and the amnion has been in any way destroyed. The presence of a layer of membrane of fair strength (the chorion), overlying the amnion beyond the placenta, can be proved by splitting the membranes into their two layers at various spots.

The decidua is found as a softish layer on the surface of the chorion, and is easily separated by gentle scraping with the nail. Small islets of this are frequently detached, but are not likely to cause any trouble, as they disintegrate and come away with the lochia. If, however, any decidual endometritis has existed, signs of it may be discovered in the shape of thickenings and of a shreddy condition of this membrane (see p. 246).

Hæmorrhages into the chorion or decidua may be found too, and these may be recent or remote; but unless they have occurred in connection with inflammation they are of no importance.

If it is judged that everything has not come away, the vagina first, and then if necessary the uterus, must be explored with the hand. The exploration should be preceded by a hot douche of 1–5000 or so at a temperature of 110 to 115°. This will wash away any loose clots or shreds, which can be examined for the missing pieces of tissue; and it will also, by its heat, cause strong uterine contraction, and thus favour evacuation.

If the placenta, or any large part of it, is retained, the case must be investigated and treated as described on p. 478.

The Vaginal Orifice and the Perinæum should now be examined for lacerations. The vaginal canal should also be explored if the head has lain for long in the passage, or if labour has been difficult, or if instruments have been used. The parts should be visually inspected, and for this the woman must be placed on her side in the semi-prone posture. The cervix may be examined by the finger for any extensive rents; but it is almost impossible to judge of moderate ones now, for after involution, tears which were an inch

[1] The absence of a cotyledon, or part of one, is roughly shown when the placenta is held in the hand, with its maternal surface upwards and concave. The cotyledons should then have a continuous surface, owing to the obliteration of the normal sulci.

or more long, and involving great thickness of tissue at the time of labour, shrink to insignificant fissures.

Tears of the perinæum involving more than the fourchette, and lacerations of the vagina if accessible, should be at once sewn up (see Lacerations of Genital Tract, p. 496). This is necessary, not only on account of the more remote results of such lacerations, but also because of the immediate danger of septic absorption from the raw surfaces. It is therefore *an essential part of antiseptic midwifery.*

The proper conduct of the third stage of labour is thus seen—and this cannot be too strongly insisted on—to be of vital importance ; and septicæmia and hæmorrhage, the two great, and practically only, dangers after a normal labour, are really under the control of the medical attendant.

CHAPTER XXV

DETAILS OF MANAGEMENT OF LABOUR IN SPECIAL LIES AND PRESENTATIONS

THE above instructions require to be somewhat modified if the presentation be that of the face or the brow ; if the occiput tend to remain posterior in vertex cases of the third or fourth positions ; or if the child be in the podalic lie.

In Occipito-posterior Positions.—It must be remembered that no reduction of this position occurs until the first-coming part of the head reaches the pelvic floor ; and that indeed, with a normally sized head and pelvis, it is almost impossible for reduction to happen before this. Consequently no attempts should be made to actively rotate the head until that level is reached. Indirect means, which imitate nature, are, however, most useful, and should never be omitted in cases where flexion is not already marked.

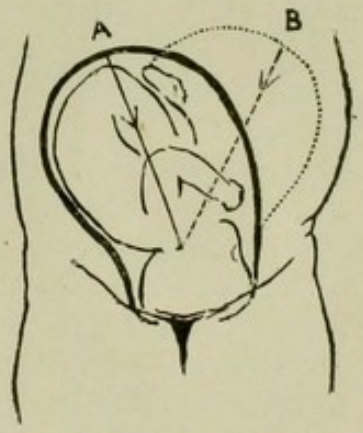

Fig. 223.—Child in second position of vertex. Flexion is promoted by the fundus being moved from *A* to *B*.

These consist in attempts at causing flexion—that is, in restraining the forehead from advancing during a pain by upward pressure on the frontal pole of the head. Such delay of the forehead is all that is necessary ; it is sometimes recommended to attempt to push the forehead backwards towards the sacrum at the same time, but this is of no use until the moment comes at which rotation should normally occur. If flexion is good, reduction will probably occur spontaneously, and artificial help is not wanted.

Advantage should be taken of the fact that obliquity of the uterus has a good deal to do with flexion or extension of the head, and the woman ought to be placed on the side to which the front of the child looks. In the

diagram, A represents the position of the uterus. The tendency to extension is remedied by placing the woman on her left side, when the uterus falls over to B.

If all efforts to induce rotation forwards of the occiput have proved useless, care must be taken not to hurry the head over the perinæum, but time must be allowed for it to mould, so that the occipito-frontal diameter, the one which will in this case distend the vulva, may be diminished.

The use of the vectis is recommended in these cases, and it will no doubt be found serviceable in bringing down the occipital pole of the head, and thus causing flexion (see Vectis, p. 386). It is an instrument not often carried by the medical man.

In some cases forceps are necessary for the delivery of the head, and their use will be governed by the ordinary principles (see p. 371).

The perinæum should be carefully inspected for lacerations.

Face Presentations.—Many ways have been devised for the conversion of face presentations into those of the vertex, seeing that a face presentation does not offer quite so good a prognosis as a vertex.

Manœuvres to this end must be employed before the membranes rupture, for after the uterus has retracted down on the child they are useless.

If a face is felt to present before the membranes rupture, or if the diagnosis be made by abdominal palpation and auscultation, Schatz recommends that an attempt be made to convert the extension into flexion. This can only be done when the chest is lying against the anterior or lateral wall of the uterus.

The shoulder in front is used to raise the head out of the pelvis, being grasped by the hand through the anterior abdominal wall. The chest is then pushed by the other hand dorsalwards as regards the child, so as to flex the trunk. The head is free of the pelvis, and will also flex if the occiput be pressed downwards and forwards. When flexion of the child is accomplished, the body is pushed downwards into the axis of the brim, so as to engage the head in a flexed attitude.

This manœuvre requires a lax uterus and lax abdominal walls. Another way, recommended by Herman, is to try to flex the head bimanually, by placing two fingers in the vagina, and the hand on the abdomen, and then pressing the jaws towards the chin end of the presenting part, and the occiput downwards. Care must be taken not to rupture the membranes.

Before making any attempt of this kind it is absolutely necessary to obtain a correct diagnosis of the presentation and position, since if this is not done such attempts will be useless.

Supposing it is found impossible to convert the presentation into one of the vertex, the following rules are to be observed.

The membranes must be preserved until full dilation, if possible; for (1) the face is a blunt and therefore bad dilator; and (2) delicate parts such as the eyes are liable to injury if they are unsupported by the counter-pressure of the fore-waters in the bag of membranes. No attempt whatever should be made to induce a vertex presentation after the membranes have burst. Such attempt would cause the risk of the head being flexed enough to lie in the attitude of a brow presentation, but not enough to be a vertex; there

would be considerable danger of injuring the eyes, and the possibility of introducing septic organisms into the uterus.

Version in uncomplicated cases of face presentation is quite inadmissible.

It has been made clear that the prognosis of labour is not so very much worse in face cases than in vertex, so that as a matter of fact the best way for those who are not sufficiently skilled to be quite certain as to the need for interference is to leave things alone. It is possible in some chin-backward cases that the head may not rotate into a mento-anterior position. In all mento-posterior cases, if extension seem to be deficient, as shown by the anterior fontanelle approaching near to the axis of the pelvis, and being too readily felt on vaginal examination, extension should be favoured by retarding the forehead during the pains, and by, if possible, pulling down the chin with the fingers in the intervals. A vectis may be used for this purpose.

The rule that such cases are reduced comparatively late is to be remembered, and premature attempts at pushing the forehead into the hollow of the sacrum avoided.

Postural treatment is most valuable here in causing extension. The woman must be placed on the same side as that to which the fœtal back is turned, thus producing an obliquity of the uterus which brings the direct intra-uterine pressure into a line impinging in front of the centre of the head (see fig. 180).

If the head persists in the mento-posterior position, an endeavour may be made to rotate it by introducing the whole hand into the vagina and grasping the face with the thumb opposing the four fingers. The external hand is used to push the anterior shoulder in the same direction as that in which the effort to turn the face is made.

If this endeavour fail, the head will probably have to be perforated.

As face presentations are frequently caused by contraction of the conjugate, a careful watch must be kept on the rate of its advance as compared with the estimated force of the pains. If after two or three hours no advance of the head occurs into the brim, and if the uterus is acting well, version (see p. 365) is the best treatment, unless the brim is found on measurement to be too small for delivery to be practicable without craniotomy, or there is any other contra-indication to version.

A look-out must also be kept for presentation and prolapse of the cord (see p. 514), which is another not uncommon accompaniment of face presentation, especially in contracted brim.

Brow Presentations.—In these cases the same manœuvres should be resorted to as in mento-posterior face presentations. Postural treatment, and attempts at increasing extension of the head, manually or by the vectis, are the only methods available after the membranes have ruptured. Schatz's method should however be employed during the first stage. The presentation will usually be found to be converted into a face case eventually.

If progress is completely arrested and forceps fail, craniotomy (p. 386) must be performed.

Breech Presentations; Podalic Lie.—It has been already said that presentations of the pelvic end of the child involve little or no increased risk

to the mother ; and therefore nothing should be done which will prejudice her favourable chances of recovery. It may be stated broadly that any interference whatever until the pelvis is passing the vulva is bad practice.

When a breech presentation has been diagnosed, and this may be done with certainty without a vaginal examination, through the abdominal walls, the fewer vaginal examinations made the better.

The membranes must not be endangered. They form a much better dilator than the breech, and it will be remembered that the head is the part on the passage of which the attention has to be concentrated. The more slowly the body passes through the parturient canal the better is the canal dilated, and the less delay will there be in the emergence of the head, which is the critical part of the case in a breech presentation.

The legs must be left alone. Pulling on them to expedite labour will in ordinary cases have just the opposite effect, for one or both of two things may happen. First, the head may become extended, if flexion is not very good, owing to the fact that the traction acts on a point of the head behind the centre. Second, the body may come down and leave the arms to slip up by the side of the head, thus very considerably increasing the already tight fit of the head.

When the pelvis is born, however, help is almost always necessary. The *cord* runs much risk of being compressed by the head, which is now entering the pelvis (see fig. 212).

The indication is to protect the cord as much as possible, and to be prepared to deliver rapidly, if necessary.

A loop of the cord is pulled down—it can be traced from the umbilicus—and placed as near as possible to that sacro-iliac synchondrosis which is not occupied by the long diameter of the child's head. If the head is in the right oblique diameter, the cord will be placed in the left posterior quarter of the pelvis ; if it is in the left oblique, in the right posterior quarter.

By observing the pulse in the loop which has been pulled down, the vitality of the child is readily ascertained.

The slack of the cord prevents the stretching which might arise, after the child is born to the level of the navel, by the body becoming suddenly extended.

When the navel is outside the vulva, the *arms* must be attended to. They must be brought down one by one before the head has reached the pelvic floor. If they are in their normal position, with the elbows down about the level of the epigastrium, this will be easy, if care be taken to move them along the anterior surface of the body, and to keep their inner surface in contact with it.

If either or both happen to be above the head, the attendant should pass a finger up to and over the shoulder corresponding to the arm which is to be brought down, and thence along the upper arm to the elbow. The arm may now be swept down in front of and in close contact with the face and chest. It is important to reach the elbow before the arm is pulled down, so as to avoid fracturing the humerus.

After the birth of the pelvis, firm but gentle pressure over the fundus is of the greatest assistance, for it keeps the head flexed and the arms down. This pressure can be carried out by the nurse.

During all the second stage of labour the fœtal pulse must be carefully watched, so that the labour may be hastened at any moment if necessary.

As the body is born it must be carried up between the mother's thighs. The perinæum is to be attended to as in head-first cases, and assisted in expelling the head of the child.

When the head has arrived at the vulva it must be delivered as quickly as possible, for the reasons already given. The simplest and best plan is that of forward traction of the body.

In considering the advantage of traction now, it must be remembered that the relation of the head to the pelvis is different at this stage from that which held while the head was higher; for at one end there is now a firm bony resistance, the pubes, and behind at the other, the distensible perinæum. When forward traction is applied to the condyles, a lever of the third order is formed, the fulcrum being at the pubes, the power at the condyles, and the weight at the centre of the head, which lies further back in the pelvis (fig. 224).

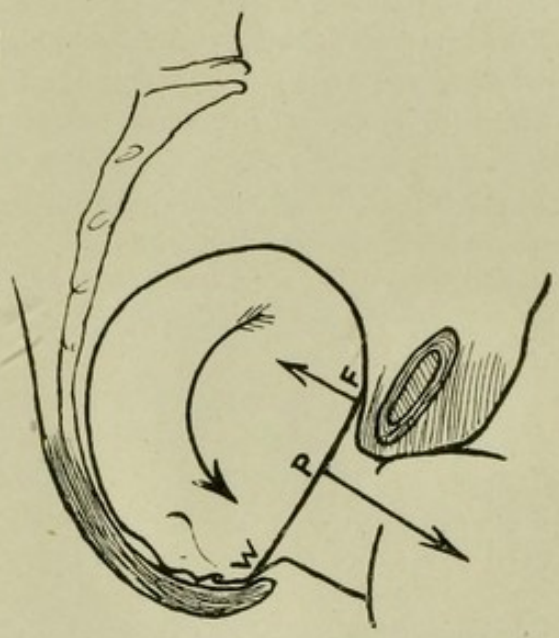

Fig. 224.—Mechanics of delivery in head-last cases. *F*, fulcrum; *P*, power; *W*, weight.

It will be readily seen in the diagram that the force *P* will bring the chin downwards, the occiput remaining behind the pubes. Consequently flexion, or rather what would be flexion if the body were in the line of the lower pelvic axis still, is brought about, and the smallest possible diameter, the sub-occipito-frontal, passes through the vulva.

To apply this principle, the body of the child, wrapped in a soft cloth, must be grasped in the right hand which carries it forwards to about a right angle to the mother's trunk. No greater angle than this is advisable, as it would cause too great a strain for safety on the front of the child's neck, and the forces act at a less mechanical advantage.

The traction is much assisted by pressure from above. This will occupy the left hand until the forehead reaches the perinæum, and then this hand will take charge of the head in its few remaining movements in the genital canal. It is well to prevent the head from coming out with too forcible a jerk, and traction may be almost discontinued when the head is delivered as far as the mouth.

There are other ways of producing increased head-flexion at the perinæal stage of breech cases, and they may be had recourse to if the just described method fail.

By passing the first two fingers into the patulous rectum the chin and forehead may be gently pressed forward. This mode is often useful in combination with the first described procedure.

By *jaw-traction*, also in combination with the first method. The fore-finger is passed into the vagina and over the chin on to the lower gum, and it can then exert firm pressure on the lower maxilla.

These last two methods are to be had recourse to successively should there be any delay at the critical moment, and fear of the possibility of rupturing the perinæum should cause no hesitation in speedy delivery of the head.

Another way of delivery of the after-coming head has been recommended —namely, that of pushing up the occiput with the fingers of one hand and exercising jaw-traction with the other ; it is, however, far inferior to those described, for pushing up the occiput gives no great advantage, while the drawing down of the chin is not so completely accomplished.

Jaw-traction has certain dangers for the child ; fracture and dislocation are not unknown, and difficulty in taking the breast for several weeks after birth is occasionally caused, if forcible traction has been made. Matthews Duncan [1] found in experiments on the dead fœtus that there was only injury when great force was used. He found that a force of 28 lbs. caused a slight crack to be heard ; but 56 lbs. produced no injury, as shown externally or found on dissection. It appears, therefore, that very considerable power can be used in this way, no doubt enough to deliver the head in all ordinary cases without running any risk. In the course of his experiments Duncan found, however, that jaw-traction had very little influence in causing flexion of the head, and that its main and almost exclusive use lay in the power of direct extraction.

By *the forceps* applied to the aftercoming head. There is no very great difficulty in applying this instrument (see p. 383) if the body of the child is drawn well forward, and by their aid the head can be rapidly delivered. They should be at hand in head-last cases, so as to be applied if necessary ; that is, on the failure of the means just described.

In sacro-posterior positions of the breech, the normal mechanism is rotation forwards of the sacrum at an early or late stage (see p. 174). If rotation has not occurred by the time the head is on the pelvic floor, increased care should be taken to prevent extension by pressing on the fundus during the pains, and by avoiding traction on the legs. No very forcible pressure should be applied to the top of the head when it has once engaged in the pelvis, however, for unless flexion is very good, and in this case a persistent face to pubes position is very rare, the occiput may be forced down and extension favoured.

In the case of extended head, where the mechanism is somewhat that of an inverted face, delivery is often impossible without extensive lacerations of the pelvic floor, as the diameter which has to pass the vulva is the cervico-vertical of 4½ in. An attempt may be made to get the head past the brim, where delay may occur, by passing the hand behind the neck into the hollow of the sacrum and trying to glide it round by the side of the head to the mouth. This will tend to turn the head into the transverse diameter of the pelvis, where there is most room for its long diameter to pass.

[1] *Obst. Trans.* vol. xx.

CHAPTER XXVI

LABOUR IN MULTIPLE PREGNANCY

IT has been mentioned (p. 74) that twin and other multiple pregnancies often end prematurely (in about a quarter of all cases), the degree of prematurity depending on the amount of over-distension of the uterus.

Other abnormalities liable to occur in the uterine contents will be remembered—namely, the death of one fœtus, the production of a mole, and of a fœtus papyraceus.

When labour does occur, the variations from the normal process are due to—

1. Impairment of the contractile power of the uterus from over-distension.
2. The presence of two or more fœtuses, which descend in various relations to one another.
3. The occasional fusion, more or less complete, of the placentæ, or of their vascular arrangements.

The first two render the conditions rather less favourable for the mother than in single pregnancies. There exists, however, a more marked difference in the prognosis for the children, owing, in addition to the above, to the occasional anomalies of presentation (breech or transverse) and to prematurity.

The usual course is as follows :—

The first child presents as usual and is delivered, the uterus being more liable to inertia than in normal labour. The mode of delivery of this child is practically that which belongs to single pregnancy. If it is not discovered before, the existence of twin-pregnancy is now made evident by the still large size of the uterus, and the evidence by palpation of its containing a second fœtus.

In a varying period, usually under half an hour, the uterus, which has been retracting on its remaining contents, forces the membranes of the second fœtus through the cervix. These rupture, and the child is born, as a rule, rapidly, owing to the previous dilatation of the passage. There now remain the two placentæ and two sets of membranes, which may be separate or more or less united. These are expelled—those of the first child usually first—after an interval which, owing to the inertia, is usually longer than in single cases.

The order is—

Formation of the bag of membranes of the first child.
Birth of first child.
Formation of the bag of membranes of the second child.
Birth of second child.
Placenta and membranes of first child.
Placenta and membranes of second child.

The commonest combination is for both children to present by the head

Next in frequency is for one to present by the head, and the other by the breech. Transverse presentations are commoner than in single pregnancies, owing partly to the uterus being roomy, so that the remaining fœtus is liable, from its loose fitting, to be disturbed and to move into anomalous lies and attitudes during the expulsion of the first.

According to Spiegelberg, the percentage of the respective combinations is as follows, in 1,114 pairs of twins :—

Two heads, 49·1 ; one head and one breech, 31·7 ; two breeches, 8·6 ; one head and one transverse, 6·18 ; one breech and one transverse, 4·04 ; two transverse, ·35. In the individual fœtuses, numbering 2,228, there were presentations of the head in 68 per cent. ; presentations of the breech in 26·48 per cent. ; transverse presentations in 5·46 per cent.

In some cases the placenta of the first child is born immediately after the child. For this to happen complete independence of the two placentæ is necessary, and under such circumstances the second child, although it usually soon follows the first, may be retained for an indefinite period after the birth of the first. The interval hardly ever exceeds a day or two, but has been extended to some weeks. In the latter case there was probably a double uterus (see p. 75).

Management.—Care must be taken, by following the uterus down and exerting firm pressure on it, to prevent the uterine inertia which is liable to occur. If a diagnosis of twins is made before the birth of the first child, the cord must be tied on both sides of the section, since the two sets of vessels often intercommunicate.

So long as the woman is not losing much, she may rest for half an hour or so, the uterus being supported during that time. The cervix should then be examined, and if pains have not come on, the second bag of membranes should be ruptured and the uterus encouraged by friction and gentle pressure to expel the second child.

The ordinary precautions against post-partum hæmorrhage will be taken, the physician remembering the tendency of the previously over-distended uterus to relax ; and if forceps are needed for the second child, this point should be specially attended to, and the uterus carefully followed down by the hand.

In places where the first placenta at once follows the fœtus to which it belongs, and the uterus becomes inactive, there is no reason for hurrying on the labour of the second child. The prolongation of intra-uterine life may be of advantage to a weaker child, especially if labour has occurred prematurely.

The same rules govern the conduct of labour in the case of triplets and other multiple births.

As in these cases prematurity is pretty constant, the children require special precautions in their management. (See Induction of Labour.)

CHAPTER XXVII

ANÆSTHETICS

ONE of the not least important uses of anæsthetics is in labour. They act not only by preventing the acute suffering which almost always accompanies parturition, but also—a matter of greater importance—they are of actual assistance in the progress of a very large number of cases. They have the power of relaxing spastic muscle, *e.g.* of the cervix, and of enabling the physician, on account of this effect, if they are carried to a sufficient degree, on the body of the uterus, to carry out any operation, such as turning, with far greater ease than in their absence.

Chloroform is the most useful drug of this kind in midwifery work, and, in the absence of any marked contra-indications, it should always be chosen in preference to other anæsthetics. The reasons for this are as follows :

1. It exercises its effects in some degree in almost any depth of the anæsthesia which it brings about. This is not the case with, for instance, ether, which has to be pretty fully given before relaxation is obtained.

2. It is very easily given, and, short of narcosis to the surgical degree, does not require that undivided attention of the administrator which ether needs.

3. It is not unpleasant to take.

4. Fatalities under its use in cases where it is not pushed to the full degree are unknown in labour, and so there is no reason on this ground for adopting the less easily manageable and less useful ether.

A very few cases have been recorded of death during labour where chloroform has been given to its full surgical degree.[1] It is only necessary to proceed with its administration to this extent when some obstetrical operation has to be performed, and under these circumstances ether may be used if the operator prefers, and if the apparatus is handy and an assistant can be obtained.

Judging from the statistics available, however, there is practically no danger in the use of chloroform to even this degree in the parturient woman, and it is therefore to be recommended under all circumstances where anæsthesia is required.

The reason of this peculiar immunity of women in labour is unknown. It has been put down to the physiological hypertrophy of the heart which occurs during pregnancy, and which tends to prevent syncope.

There are various degrees of anæsthesia obtainable by the administration of chloroform : one, a slight degree, which, while not depriving the patient of consciousness, does relieve her of pain, and is absolutely safe ; and another, the full degree, which is practically safe.

We will here confine our attention to chloroform. Probably the best way of giving it is by means of Junker's inhaler, though many prefer to give it sprinkled on a towel or lint. If a Junker is chosen, the bottle containing the chloroform may be fixed to the rail of the bed out of the patient's way,

[1] Charpentier, *Bulletin de la Soc. Obstet. de Paris*, No. 5, 1889.

and she may be entrusted with the face-piece after she has been shown how to apply it during one or two pains. When the suffering at each pain becomes acute—as, for instance, when the head distends the vulva—if the patient loses her self-control the nurse must take charge of the face-piece.

If deep anæsthesia is necessary in case of an obstetric operation, an assistant is very desirable, and in some cases essential, for the physician can then devote his whole attention to the operation.

The administration of chloroform is an important treatment in cases of eclampsia and chorea.

We may now consider its use in the three several stages of labour.

First Stage.—Chloroform should not be used, as a rule, before rupture of the membranes. There is little need of it on the ground of suffering, and cases of rigid os will usually yield to simpler remedies. It is, however, a fairly sure remedy in certain cases of rigid cervix (see p. 188).

Some patients may be the better for it if they suffer severe pain at the end of this stage. It should, however, be avoided if possible.

Second Stage.—It is now that anæsthesia, or analgesia rather, is most useful. The patient, relieved to a great extent from suffering, will use her abdominal muscles more freely; and, by giving a little more of the drug, the physician can restrain her otherwise sometimes uncontrolled action more effectually. This latter advantage is most conspicuous as the head is just about to be delivered and the perinæum is in danger, for it renders more easy any attempts to squeeze the head out between the pains.

In cases where full anæsthesia is produced, care must be taken that no vomited food is sucked into the larynx. Vomiting is hardly more likely to occur under the present conditions than when the patient has been prepared for the anæsthesia of a surgical operation, since the woman has probably taken no solid food for several hours.

Third Stage.—Since chloroform is considered by many to predispose to post-partum hæmorrhage, the uterus should be carefully watched during this stage in cases where the drug has been administered during the second stage, though in all probability there is little or no danger added.

It is never desirable to give it in the third stage of normal labour, even to insert stitches, unless the laceration of the perinæum has involved the sphincter ani; for the perinæum is usually rendered fairly insensitive by the stretching which it has undergone.

Effects on the Child.—No prejudicial effects on the child have been established.

The writer has seen one or two new-born children in which there has seemed to be delay in the establishment of full respiration, and where the delay could not be accounted for in any other way than by assigning it to the chloroform, which in each case had been administered for longer than the usual period.

Chloroform has been found in the placenta after expulsion, and in the urine of the new-born child.[1]

[1] Porak, *Bull. et Mém. de la Soc. Obst. et Gyn. de Paris*, No. 1, 1890.

PUERPERAL PERIOD

THE puerperal period commences after the birth of the placenta and membranes.

The uterus has now done its duty and sinks into the background ; and the breasts come to be the important organs.

In the transference of prime function from the uterine system to the milk-secreting one there should be no constitutional disturbance. Preparation has been made for this transference during the later months and weeks of pregnancy, by the functional development of the breasts and by the changes in the circulation and mucous membrane of the uterus (sinuses and decidua) already described ; and thus under normal circumstances there is no evidence of strain of any kind when the breasts take on their full duty. The 'milk-fever' or 'weed' described as normally occurring on the third day is proved to be due in almost every case to septic absorption, by the fact that in aseptic cases no constant rise of temperature occurs about that period.

The most important modification existing during the puerperal period is the fact that the woman has at least one large fresh absorbent surface, the recently denuded placental site, and in nearly every case many other smaller ones due to laceration and bruising of the cervix, vagina and perinæum, and other tissues.

It is almost entirely on account of the existence of these places of weak resistance that the puerperal woman is in a state of less stable equilibrium as regards health than her non-parous sister. Her nervous equilibrium is easily disturbed, however, and, as will be seen, such disturbances may at times cause some unnecessary alarm if the proper cause is not recognised.

The essential phenomena of the period are then—(1) the return of the enlarged and otherwise modified genital apparatus to its nearly original condition, and the effects of this process on the secretions and excretions ; (2) the establishment and process of lactation and its accompanying phenomena.

The natural history of the puerperium will be considered mainly as falling under one or other of these two heads.

The alterations in the general functions of the body will be dealt with briefly. They are mostly the result of the bodily exertion during labour ; of some of the local effects of labour ; and of the diversion of the energies of the economy towards the production of milk.

CHAPTER XXVIII

UTERUS AND OTHER PELVIC ORGANS AFTER LABOUR

Clinical phenomena.—During the first hour or so after delivery the uterus is alternately contracting pretty vigorously and relaxing slightly, and is of about the size of a fœtal head. It is felt four or five inches above the pubes as a distinct, somewhat flattened mass. If only the extreme fundus is felt, the comparison anciently made to a cricket-ball might be justified; but if care be taken to palpate all the uterus which lies above the brim of the pelvis the organ will be found to be much larger, and certainly not spherical.

Within the next few hours, however, it relaxes considerably, and at the end of twelve hours or so is found to reach on an average about six inches above the pubes [1] (fig. 225).

There is, of course, no hæmorrhage during this relaxation owing to the retraction present.

The height of the uterus above the pubes a few hours after delivery is considerably understated in most text-books.[2] In some cases, when the woman has been lying on one side the fundus is found displaced to that side, and then the measurement above the pubes may amount to ten or eleven inches. Knowing this, the medical man will not be alarmed if he finds such a mass within the abdomen when he makes an examination of this region. The uterus is, as a rule, anteflexed to a greater or less extent, and remains so during its involution.

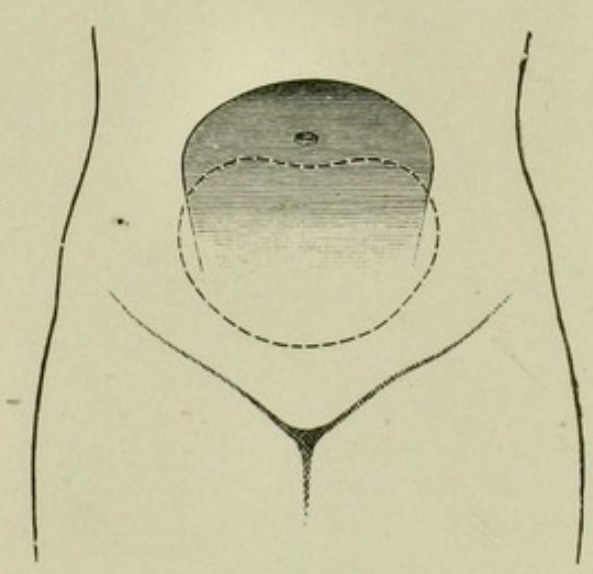

Fig. 225.—Height of fundus on first day of puerperium.

Though in height it reaches to about the same level as it attained at the sixth month of pregnancy, its width is less than that of a six months' uterus, and it is in width and depth from before backwards that its main diminution has occurred. It is often very tender to the touch for some days after delivery. Contractions, which in multiparæ are often painful (see After-pains, p. 216), are occurring at intervals during the first few days. They are accompanied by regularly advancing retraction.

[1] This is the average of a large number of cases (several hundred) investigated at the General Lying-in Hospital. The patients were as nearly as possible under the same conditions of bladder, rectum, &c.

[2] Lusk, 4½ inches, Charpentier 4¾; Webster also says 4¾ in the cadaver.

Day by day the uterus decreases in size, and this decrease is fairly shown by external measurements. It must be remembered in making these that the uterus may be more anteflexed than usual or may be retroverted or retroflexed, and in some cases may be lateriflexed ; and that fulness of the bladder or rectum or both may make a difference of several inches in the height of the fundus. Allowing for these causes of error, the diminution in size will be found to average about three-quarters of an inch in a day for the first five or six days ; and at the end of ten to twelve days the highest part of the uterus is level with the brim, *i.e.* about two inches above the pubes (figs. 226 and 227).

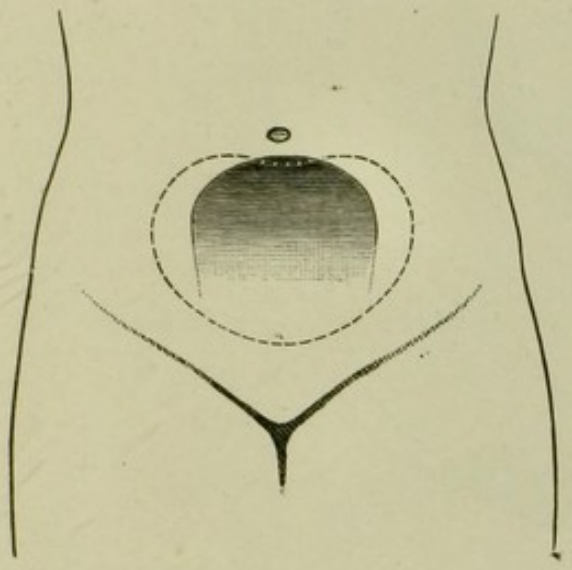

Fig. 226.—Height of fundus at about end of first week.

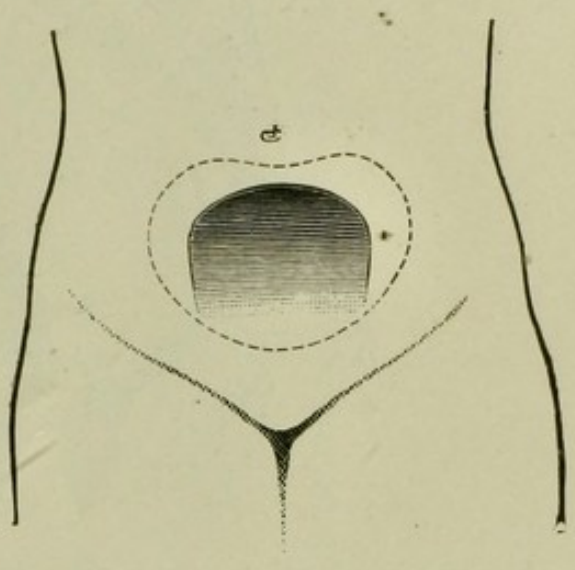

Fig. 227.—Height of fundus (at brim) at end of second week.

Involution appears to be more rapid during the first few days ; but this impression is not borne out by frozen sections. In about eight weeks the uterus has diminished to the size at which it will remain unless disturbed by a fresh pregnancy—that is, to the size of a normal parous uterus (see p. 224).

Cervix.—The cervix will be found, if examined, to be a flaccid tube applied loosely to the lax vaginal walls. As the finger is passed into its cavity and reaches the level of the internal os, this latter may be found to be contracting, and of a firmer texture.

In nearly all cases, but especially if labour has been prolonged and there has been much thinning of the *Lower uterine segment*, the retraction-ring may be felt at a height varying from a finger's breadth to an inch or more [1] above the internal os as a very firm ridge. This ridge has by many observers been considered wrongly to be the internal os. Above this ridge again is the thick fleshy uterine wall, with the placental site projecting from some part of its surface, and feeling like a raised and roughened portion of the mucous membrane which is elsewhere quite smooth (figs. 228 and 228 A).

During the first forty-eight hours the lower segment which has hitherto been stretched undergoes retraction.

As the cervix gets firmer during the first fourteen days, any lacerations which may have occurred are to be more distinctly made out.

[1] Three inches in a specimen described by Barbour and Webster.

The anatomy of the generative organs during the puerperium has now to be considered, and the variations in shape and size of each organ in the pelvis noted; namely, of the uterus, vagina, bladder, and uterine appendages.

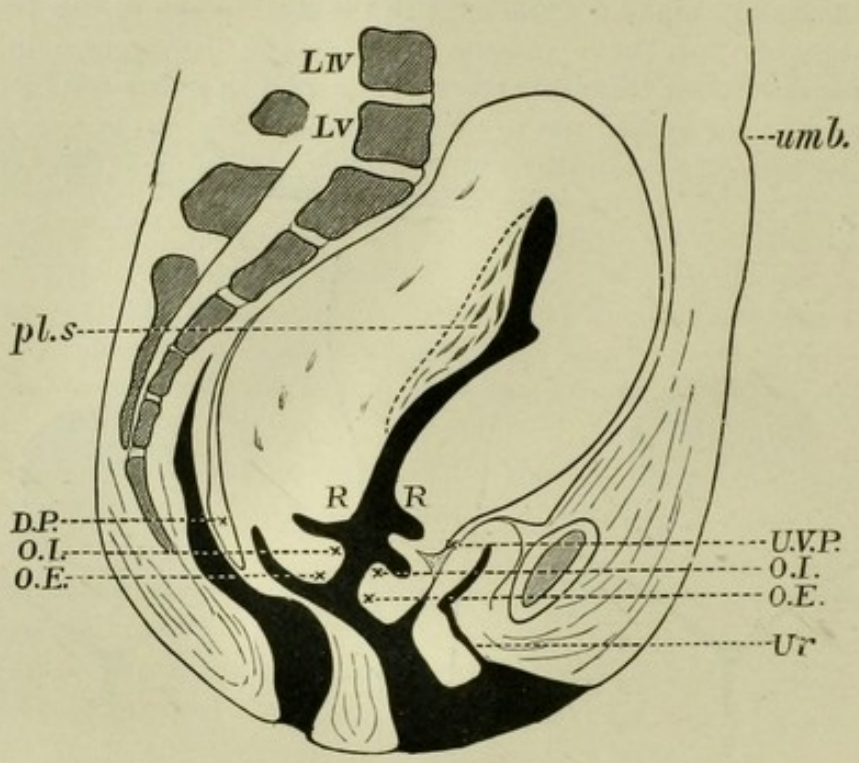

Fig. 228.—Uterus and other pelvic organs immediately after labour. *L* IV, *L* V, lumbar vertebræ; *umb*, umbilicus: *R*, retraction-ring; *U V P*, utero-vesical pouch; *O I*, os internum; *O E*, os externum; *Ur*, urethra; *D P*, Douglas' pouch; *pl. s*, placental site. (From Webster's frozen Section.)

For most of the facts at present known as to the anatomy of this period we are indebted to the studies of frozen sections made by Webster, Barbour, Pinard, Varnier, Winckel, and others, which on almost all points are quite reliable for this purpose.

Anatomy of the parts immediately after Labour.—The uterus lies with its fundus in contact with the anterior abdominal wall and the upper part of the back of the symphysis pubis. It fills up the pelvis, and lies in an anteverted and anteflexed state, usually rotated to the right. Its shape is not constant, but is usually an irregular ovoid. On transverse section at about its middle in length it has been found to be pretty nearly cylindrical.

The walls of the body are pale and bloodless on section owing to the tight contraction and retraction. (This condition of emptiness of vessels is maintained for two or three days.)

A distinction is easily made between the upper thick and the lower thin uterine segments, and between the latter and the cervix.

The Upper Uterine Segment is thick-walled (about 1½ in.), pale pink on section, has a cavity of greater or less capacity, according to the amount of clot contained in it, and shows on some part of its surface the placental site which is darker in colour. This segment constitutes the greater part of the uterus.

Lower Segment (or Isthmus).—This is separated from the retracted upper segment by a well-marked line (see figs. 228 and 228 A).

It is shorter than it was during the second stage of labour, for some of it has retracted into the upper segment. It is thrown into folds (see fig. 228) owing to the weight of the upper segment.

The *Cervix* is thicker than the last-described portion of the body and the

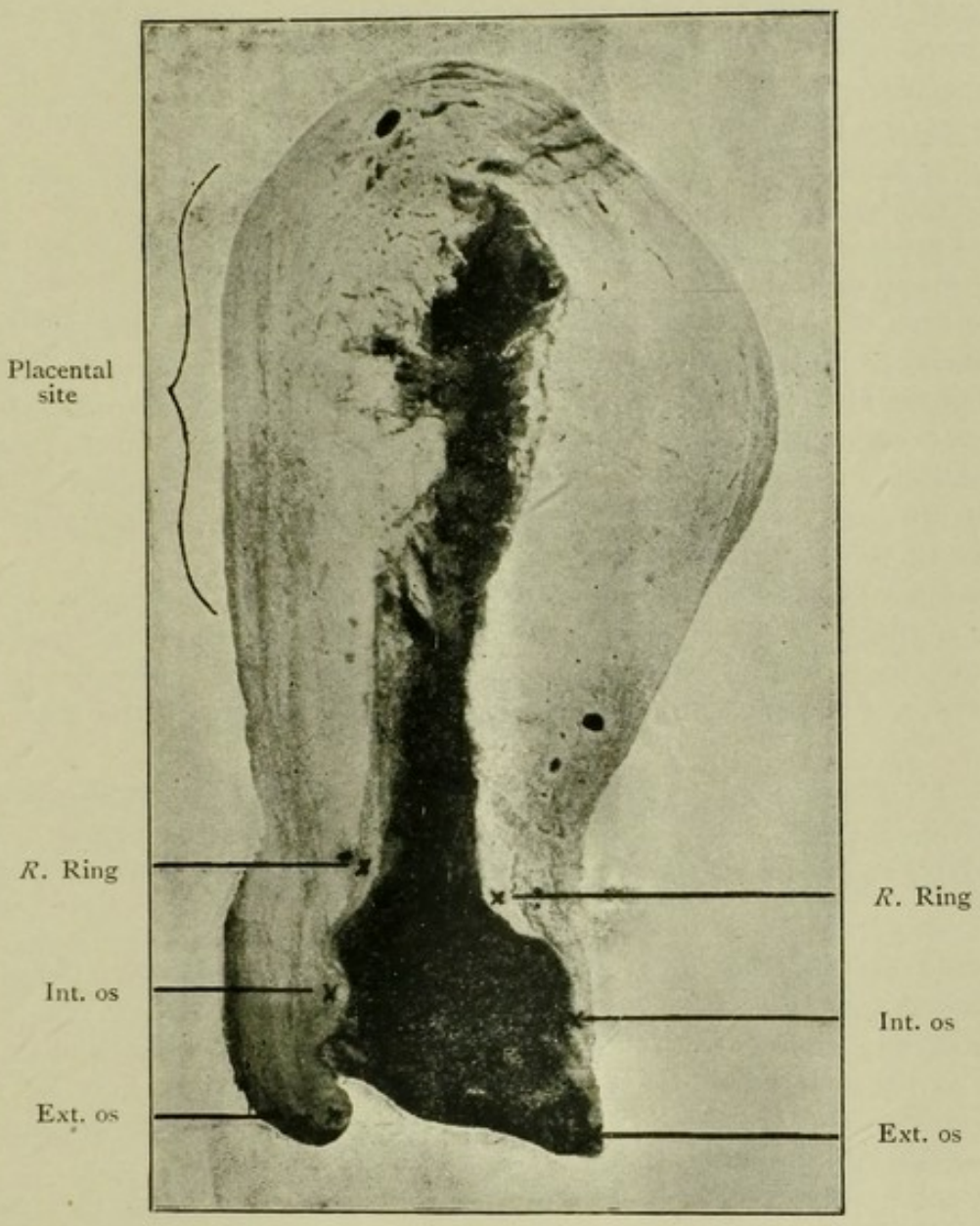

FIG. 228 A.—Section of uterus shortly after labour. *R.* Ring, retraction-ring ; int. os, internal os ; ext. os, external os. (St. George's Hospital Museum.)

internal os can be roughly made out. What has usually been described as the tight ring of the internal os was really the retraction-ring.

The length of the cervix is about 2 in., though the external os is not well marked ; and the lips are everted to a variable degree. They rest on the posterior vaginal wall, and are flattened from above down by the weight of the uterus.

The lower part of the cervix is much congested, and thus contrasts with the bloodless body.

Internal Surface of the Uterus.—This surface consists of two main parts, the placental site and the rest.

The *placental site* has a ragged surface, showing the openings of torn sinuses, and forms a convex elevation above the plane of the rest of the surface. The uterine wall beneath now appears rather thicker than that of the rest of the body, and this area often bulges inward somewhat (compare its thinness before detachment of the placenta, fig. 133). This thickness is not muscular, for if muscle alone is considered the wall is thinner here. The increased bulk is due to thrombosed sinuses.

The site measures about 4 × 3 in., and is thus roughly the size of the palm of the hand.

This area is usually on the antero-lateral or postero-lateral wall ; quite exceptionally on the fundus.

The area of the attachment of the membranes occupies the rest of the inner surface. It is much smoother than the placental site, and has small shreds of decidua adherent here and there. A part of it corresponding to the lower segment is still smoother than the rest, and on microscopic examination is found to have scantier glands and smaller decidual cells.

The internal surface is found to be smooth also over a small area at the entrance of the Fallopian tubes.

The inner surface of the upper part of the cervix is continuous with the inferior segment of the body, and no very definite boundary (internal os) is, as a rule, to be found between them. The lower half, however, is much congested, not being contracted and retracted like the rest of the uterus.

The *Vagina* has roughly its usual shape on longitudinal section. It is much stretched and its walls thick and bulging inwards in various directions, the anterior vaginal wall especially bulging downwards.

Hymen and Lacerations of the Vulva.—The hymeneal orifice is found to be stretched and torn to a variable degree. The tissues are very soft, and, in case of any unsutured perineal tear, the granular raw surface of this can be felt partly covered with clot. Tears, usually superficial, may be found running on to the vestibule, or affecting the attachments of the urethral orifice or the labia minora.

The pelvic floor and perineal body are lower compared with the plane of the pelvic outlet by about an inch or so than in the nulliparous state.

Tubes and Ovaries.—These lie just above the brim, packed in between the uterus and the pelvic wall. The ovaries are very close to the uterus, owing to some lateral expansion of that body during retraction. The ovarian ligaments are spread out on the uterine wall.

Bladder.—This is seen by the diagram (fig. 228) to lie in its usual position, and to have again become a pelvic organ. It naturally sinks down

with the lower uterine segment, to which it will be remembered it is closely attached. It lies usually out of the middle line, this depending on the position and rotation of the uterus, and under the uterus; so that any distension which occurs will raise, and, if continued, retrovert, the womb.

The urethra and urethral orifice are now nearly in their usual position, having, as a rule, descended somewhat.

Peritoneum and Broad Ligaments.—The peritoneum on the lateral portion of the uterus and in Douglas' pouch is wrinkled owing to its not having completely followed the shrinkage of surface undergone by the uterus itself (see p. 100, Elasticity).

The upper edges of the broad ligaments are free to lie as they please. The part below the edge is occupied almost completely by the thickened uterus, and the part unoccupied is compressed between the uterus and the pelvic wall. Since this compressed part contains the arteries, ovarian and uterine, on which the uterus depends for its blood supply, its compression must have a very marked influence in keeping the uterus anæmic.

CHAPTER XXIX

INVOLUTION

Size of the Uterus.—This does not seem, according to the evidence of frozen sections, to decrease much for the first few days. It has already been mentioned that within the first twelve hours the uterus, when it relaxes immediately after labour, increases in size, as far as the evidence of measurement through the abdominal walls can demonstrate this, and that according to these measurements reduction is most rapid during the first days. According to the evidence of frozen sections, it lies at or below the level of the brim by the sixth day; it can, of course, be felt above the pubes for many days after, unless it is retroverted. Anteflexion is the rule throughout, though there is nothing abnormal in retroflexion.

In nearly 300 cases in which careful measurements were taken at the General Lying-in Hospital, the fundus was found to be level with the brim in 20 on the seventh day, 40 on the eighth day, 20 on the ninth, 70 on the tenth, 60 on the eleventh, 73 on the twelfth, and in the remainder on some day after the twelfth.

The wrinkling of the peritoneum gradually disappears, and the broad ligaments assume their normal relations as the uterus diminishes.

The area of the placental site diminishes with the uterus, and the uterine wall over this area remains somewhat more projecting than in the rest of the uterus.

The distinction in thickness between the upper and lower segments

disappears soon after the first day, owing to the retraction of the lower segment. The internal os for a few days remains difficult to define. The cervix gradually shortens; but its diminution has been said, from clinical observation supported by the evidence of frozen sections, not to begin until about the fourth day.

Changes in Muscle and Vessels. *Muscular Layer.*—Owing to the continuous squeezing of the sinuses by the contractions of the uterus after labour, these channels are almost bloodless, except where thrombosis has occurred. Gradually, however, this anæmic condition becomes less marked, and about the sixth day the circulation in the uterus becomes freer. Fatty degeneration of the muscle has been described as the process by which absorption of the now useless muscle fibres takes place, but no observer of late has found any fat globules in the cells.

Fatty degeneration is usual during the absorption of many inflammatory products, and may occur in the uterus if the tissue has been damaged; but there is no reason to expect it apart from pathological processes, and absorption occurs most likely by some process of solution.[1]

New muscle fibres were believed to be developed from the embryonic cells in the connective tissue, and their production was said to occur earliest (fourth week, Spiegelberg) in the subperitoneal layer. This is contradicted by Helme (see foot-note).

Changes in Vessels. *Arteries.*—The enlarged arteries have shrunk to correspond with the marked diminution of blood-flow through them, and their channels in the uterine wall are almost obliterated (see fig. 59, p. 44). The walls of those remaining are, however, not absorbed in proportion with the rest of the tissues. They indeed never undergo complete involution, but always remain as evidence of the occurrence of pregnancy, standing out as thick stumps of tubes on a section being made of a parous uterus.

The ovarian and uterine arteries remain more tortuous than before pregnancy.

The changes in the *sinuses* during the last month or so of pregnancy have been described and figured (p. 43).

The thrombosis then begun is now completed, and the sinuses are obliterated by connective tissue forming in the clot and proliferated endo-

[1] Helme (*Trans. Royal Soc. Edin.* vol. xxxv. pt. 2) has investigated this subject very fully in the case of rabbits. He finds that there is no fatty change in the *muscle*, and that the process is an atrophy rather than a degeneration; for if it were the latter there would be an increase in the connective-tissue corpuscles, which always occurs during degeneration, and this does not exist here. There is merely a diminution in volume, probably by a process of solution (? peptonisation). He believes that there is no production of new fibres to take the place of the old ones, since there is no karyokinesis. In the *connective tissue* he finds that the fibres and cells become granular. Some of the fibres swell up, become hyaline, and break down into granules, and in the subperitoneal connective tissue some fat-cells are produced. In places the destruction is complete. Epithelioid cells lie around the blocked capillaries, and become filled with granules from disintegrating red blood-corpuscles. He also finds that the *arteries* disappear in large proportion in the same way as the sinuses do—by endothelial proliferation and conversion into connective tissue.

thelium. The results of this change are very obvious on section at and after four weeks, and are most numerous at the placental site ; they can be distinguished for a year or perhaps more (J. Williams).

Mucous Membrane.—After separation, through the ampullary layer, of the stratum of the decidua which is expelled with the amnion and chorion, the deeper layer, consisting of the fundi of the uterine glands and the cells filling up their interstices, is the only representative of mucous membrane remaining.

The surface of endometrium covering the placental site differs slightly from that of the area which has been covered with decidua vera in being thinner and much more irregular, and being interrupted by the mouths of many torn sinuses.

The regeneration of mucous membrane proceeds by a growth of new glands which start from the unshed fundi, and by increase of the interglandular tissue.

During this process a free discharge takes place from the inner surface of the uterus, constituting the greater proportion of what is known as the *lochia.* At first blood oozes from the torn sinuses of the placental site. This soon gives place to serum, which is blood-stained, and contains many leucocytes and epithelial cells. When the remaining clots have disintegrated, the serum from the newly forming surface, together with the cervical mucus, constitute the fluid part of the lochia ; and the leucocytes increase in number, for during the regeneration the greater part of the surface is in a condition something, but perhaps not strictly, comparable to granulation.

This reconstruction is complete by the fourth or fifth week, the placental site being the last to return to its former state.

When the mucous membrane has been physiologically restored there are found submucous spots of pigment, especially over the placental site, which remain as indications of a previous pregnancy. Pigmentation may, however, be the result of inflammation, so it is not sufficiently characteristic of pregnancy to be ground for an absolute diagnosis.

Vagina.—The increase in all dimensions existing after labour gradually subsides, and the tissues become firmer and lacerations heal.

The *perineal body*, if not torn beyond the usual amount, very nearly regains its usual shape and texture, the fourchette and vaginal orifice being altered as described. The pelvic floor is found to be lowered permanently in a very large majority of cases.

The **ovaries and tubes** return to their ordinary situation in the pelvis as the uterine fundus descends, and the broad ligaments recover their relations as the uterus shrinks towards the middle line.

Abdominal Walls.—The elements composing these structures have undergone stretching and some hypertrophy during pregnancy (p. 51), and have now to return to their former condition, just as do the organs of generation properly so called.

The skin, which is often, especially in multiparæ, thrown into loose wrinkles after labour, regains its elasticity to a varying degree ; the striæ

gradually lose their pinkish or purplish colour and become white, often, however, remaining pigmented ; the recti in normal cases become approximated if they have not been much separated by yielding of the aponeurosis at the linea alba.

Sometimes they do remain separated to a variable extent, and this can be rendered very obvious if the woman is told to raise her head as she lies on her back, for an elliptical projection filled with intestines or omentum then appears between the recti. This separation, *diastema rectorum*, is sometimes in subsequent pregnancies combined with anteversion of the gravid uterus, constituting the condition known as pendulous belly (see p. 271).

Joints of the Pelvis.—These soon become firmly knitted again. The relaxed ligaments shorten, and do not permit the increased movements of one bone on another which prevailed during pregnancy.

The involution of these structures does, however, fail sometimes, and trouble is caused by the want of firmness when walking is attempted (see p. 568).

Thorax.—The widening of the base of the thorax found to occur during the later months of pregnancy now diminishes to some extent, but does not entirely disappear. The diaphragm has a greater range of movement.

The position of the heart's apex, which moves outwards somewhat towards the end of pregnancy, now gradually returns to the ordinary.

CHAPTER XXX

LOCHIA, AFTERPAINS, LACTATION

Lochia.—This is a discharge from the vagina of the lying-in woman. It is a result of the changes which are taking place at the inner surface of the uterine body and cervix, and in lacerations and abrasions. It begins to flow when the placenta has been expelled, and persists on an average for about twelve days to a fortnight.

It consists at first of the oozing from the torn sinuses and vessels, and is almost pure blood, mixed with some cervical mucus.

As a rule, there are small clots in the discharge ; but large ones, the size of the palm of the hand, are sometimes expelled in quite normal cases.

After three or four days the blood begins to diminish in quantity, and the discharge becomes chocolate-coloured and then paler. Leucocytes are now more abundant, and with them are found shreds of decidua, and epithelial cells from the cervix and vagina, mucus corpuscles, and granular cells.

The red corpuscles become fewer, and on the ninth day or so entirely disappear, the discharge now being of a creamy colour and consistence.

Cholesterin crystals are found for a short time about now, and the epithelial elements almost disappear. The discharge then gradually merges into slight excess of the ordinary mucous secretion of the cervix, and finally vanishes.

The quantity has been found by recent careful measurements in a large number of cases to be about 10½ oz. in all, and not about 50, as was stated by Gassner on the strength of only a few observations. It varies slightly according to the size of the child and placenta and the temperament of the individual, dark women losing more than fair ones. Women who habitually menstruate profusely lose more than those who usually see little at menstruation.[1]

Afterpains.—The uterine contractions occurring at intervals of varying length have been already alluded to. They are usually attended with more or less pain, though this symptom varies greatly in different cases. A moderate amount of pain seems in multiparæ to be normal, but most primiparæ go through their lying-in period without any suffering worth speaking of.

Afterpains, if severe, are no doubt due to irregular, and therefore incomplete, contractions, caused by the irritation of something, usually a clot, of which the uterus is trying to rid itself.

The pains are therefore more liable to occur in the case of uteri which allow clots to form, and are not in perfect expulsive order. These conditions are found in multiparous uteri which have been stretched and weakened by previous pregnancies, and which may have not completely retracted during the shortened labour which is connected with multiparity. Twin pregnancy and hydramnios, both of them causes of over-distension of the uterus, are also frequently associated with severe afterpains. The pains, when they occur, do so as a rule only during the first two or three days. Their frequency varies from eight or ten times in the day to four or five or more an hour.

During their presence the uterus may be felt through the abdominal walls to very distinctly harden. They are occasionally severe enough in sensitive women to exhaust the patient considerably, and to interfere with convalescence.

It may be difficult in some cases to discriminate between the effects of the pains on the nervous system in causing slight rises of temperature and the absorption of some septic products of matters retained in the uterus.

Breasts. Secretion of Milk

The mammary glands (see p. 52) have during pregnancy been preparing for their complete function, and at the time of labour, and often for some weeks before, a good amount of secretion can be squeezed from the nipple.

The fluid thus obtained is thinly mucoid, with streaks of creamy-looking matter running through it. This character is preserved for the first two days, during which time there is a slight increase in the quantity obtainable.

The condition of the acini of the glands is that already described, and the streaks are due to the admixture of the colostrum corpuscles (altered

[1] Giles, *Obstet. Trans.* vol. xxxv.

epithelial cells) with the almost clear fluid. These products of cell degeneration contain a certain amount of albumin, which may be separated as a precipitate on boiling. Casein is not yet secreted in appreciable quantities, though a few milk globules are visible on microscopic examination.

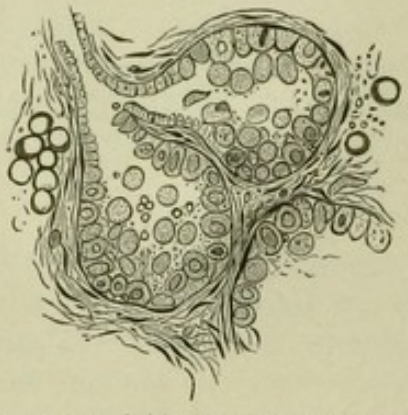

Fig. 229.—Acini in the colostrum stage.

Fig. 230.—Acini in the milk stage.

The colostrum, about the third day, merges into the fully developed secretion of the gland—namely, milk,

The acini, on being examined now, are found to have a more regular lining of epithelial cells than they had in the colostrum stage. There are no loose granular cells in the cavity (see figs. 229 and 230), and the fat globules characteristic of milk are produced by changes in the cell contents, the cells remaining attached to the basement membrane and allowing the globules to escape through their walls.

During this development the breasts become large and congested, being slightly lumpy in feel, and having distended veins on their usually sensitive surface ; sometimes there is considerable throbbing pain in cases where for some reason, probably that of over-secretion, the lobules are over-distended.

There is *normally no rise in temperature whatever*, and any fever which occurs now must be put down to septic absorption, unless it be one of the very transient rises characteristic of the puerperal state (see p. 220), possibly in this case due to the pain caused by the tension existing in the glands.

Composition.—Human milk is an opaque, bluish-white fluid, composed of serum holding in solution milk-sugar and traces of salts (chlorides and phosphates of potassium and calcium) and casein, and in suspension (emulsion) particles of fat (butter) measuring from ·001 in. in diameter downwards.

Analysis.—Rotch gives the following as the proportion of the different constituents :

Fat	4 per cent.
Proteids	1—2 „ „
Lactose	7 „ „
Ash	0·2 „ „
Total solids	12—13 „ „
Water	88—87 „ „

Under certain circumstances milk may contain, in addition to its normal constituents, foreign soluble substances which have passed through the

mother's blood, such as sulphate of magnesia, salicylate of soda, potassium iodide, atropine, and the purgative principles of castor oil. Substances that do not appear to pass into the milk are mercury, opium, acids.

Specimens of milk from different women show much variety on analysis. The most important point is the quantity of fat and of proteids present per volume. Milk is of bad quality if there is much proteid and little fatty matter. The quality of the milk depends very much on the health of the woman. It may even be suppressed by emotion ; menstruation occurring during suckling has been found to alter the milk, but not in any definite manner as regards the proportions of its constituents.

As the months of suckling go on, the milk becomes of a poorer quality as a rule, containing more sugar and less proteids in relative proportion. This change may, however, be due to the woman's general condition having deteriorated in the later months.

CHAPTER XXXI

CHANGES IN THE GENERAL SYSTEM

Skin.—The skin acts freely during the first week or so of the puerperium, and this is found to take place in the absence of any increased warmth of surface. This condition exists with, and is analogous to, the activity of the breasts.

In connection with this increased function of cutaneous structures, it has been mentioned (p. 58) that lumps which are of purely cutaneous origin occasionally appear during pregnancy and lying-in in the axillæ and in their neighbourhood. Some of these lumps, on being squeezed, now exude a milky fluid ; others have no orifice.

During this period the pigmentation of the skin which develops during pregnancy gradually fades ; but where it has been of marked degree it never entirely disappears. The striæ, if unpigmented, become whiter and more opaque as time goes on.

Circulatory System. *Heart.*—The displacement and hypertrophy of this organ which have occurred during pregnancy now disappear. This process may be considered as somewhat analogous to the diminution in size of the uterus, and is partly of the nature of retraction.

The apex, if sufficient displacement has occurred to be noticed, is found to gradually return to its normal position, partly by the thorax to some extent resuming its former width of base, and partly by the subsidence of the cardiac hypertrophy.

The heart sounds too are modified during the first few days of lying-in, in that a bruit of a soft blowing character, first described by Angel Money,

can be detected at the apex. In 100 cases specially observed recently at the General Lying-in Hospital, this was found in 57.

Pulse.—The pulse has hitherto been described as being exceptionally slow during the puerperium, and is stated by some authors to go down as low as 40 beats per minute. Such slowness as this must be very exceptional. In a series of consecutive normal cases in which the pulse was carefully taken at the same hospital, it was found that the average rate was not lower than 72 (see Chart (fig.231), and Probyn-Williams' [1] and Cutler's paper). The pulse rate was faster in the morning than in the evening throughout this series.

The same observers have examined the pulse tension in a large number of normal cases. They find that in a few instances the tension is diminished by delivery; but in the majority it is increased, and that this increased tension may persist throughout the puerperium.

The uterine bruit can frequently be heard for from twenty-four to forty-eight hours after the expulsion of the placenta. This fact shows that no possible diagnosis of the position of that organ can be made by auscultation.

Blood.—By some observers the amount of hæmoglobin and of red corpuscles has been found to be diminished, by others to be increased.

The varicose veins and œdema which have been described as often accompanying pregnancy rapidly diminish. The latter disappears, but not always the varicose veins.

Respiration and Temperature.—*Respiration* is somewhat slower during the puerperium than it is during labour (the rate being taken in the intervals between the pains).

The *Temperature* is that of a healthy person, as is seen from the accompanying chart, constructed from the average temperatures of 100 normal cases. It will be seen to be a temperature with a mean of 98·4°, with the highest and lowest temperatures of the day somewhat exaggerated. Thus the temperature taken about 8 A.M. is on an average 98°, that in the evening at 6 P.M. averages about 98·8°, the temperature on the evening of the first day being the highest and averaging 99°. The chart shows also that the pulse and temperature have the peculiarity of moving during each day in an opposite direction, for the pulse is higher in the morning and lower in the evening. The respiration tends to follow the pulse in its daily movement, and is therefore also contrary in this respect to the temperature. It is possibly in agreement with its increased daily excursion that the temperature of the lying-in woman is easily disturbed.

Emotion and excitement, such as that as caused by visits from friends, and *constipation* and *tension of the breasts*, may each cause a considerable rise (see chart, figs. 388, 389 and 391, pp. 562 and 569). This is, however, as a rule extremely transitory, though often alarming enough for the moment. Sometimes 105° is reached in cases due to the first-named cause; but if the temperature be taken an hour or two later, it will nearly always be found to have regained the normal. In the last two kinds of disturbance the elevation disappears when the bowels are well opened, or when the breasts are relieved of their engorgement. There is thus *no such thing as a normal rise of tem-*

[1] 'Some Observations on the Temperature, &c.,' Probyn-Williams and Cutler, *Obst. Trans.* vol. xxxvi.

perature on the third day. This phenomenon has been described as an event which is quite to be expected, but in the light of our present knowledge it must be considered as a matter requiring investigation in all cases. It

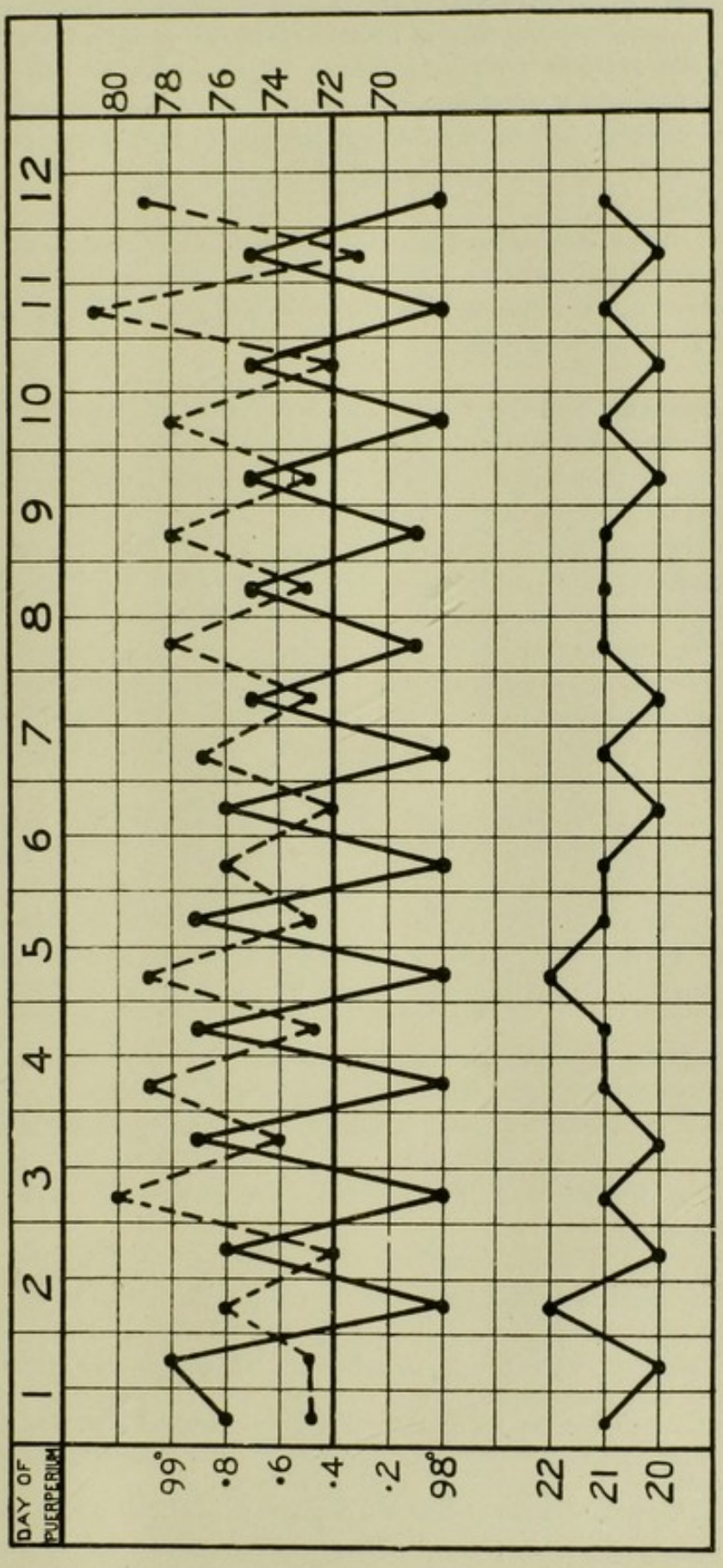

Fig. 231.—Typical average chart of normal puerperium. (Probyn-Williams and Cutler.) Upper continuous line = temperature; lower continuous line = respiration; dotted line = pulse.

was formerly due no doubt to the slight septic absorption which almost invariably occurred in cases where the genital tract, especially at or near the vulvar outlet, had been lacerated during labour. This is well shown by comparing the results of observations made at the General Lying-in Hospital in 1882,[1] before antiseptic measures were carried out with the perfection now reached, with the records compiled during 1893 and 1894.[2] In the former list of cases there was a constant rise on the third day, which was most marked in cases where lacerations of the perinæum had occurred; whereas in the latter cases such lacerations caused practically no difference in the temperature chart.

Bowels.—The intestines are always sluggish in their action after labour. This is due in great part to the want of support they suddenly experience from the relaxed conditions of the abdominal walls, and the consequent diminution of abdominal tension.

Urinary System.—There is not seldom retention of urine for twenty-four hours or more after labour. This is brought about by several causes, which may act alone or in combination. (1) A bruised and swollen condition of the urethra, which, according to Spiegelberg, affects especially its upper end. This causes pain on attempts to pass water, and, in consequence, inhibition, which may be partly voluntary, partly reflex. (2) Diminution of the intra-abdominal pressure, which has been seen above to influence the intestines. The abdominal muscles constitute the most important agent (Matthews Duncan) in emptying the bladder, and at this period they are temporarily useless owing to their previous stretching. (3) The patient is deprived of the assistance of gravity by reason of her lying in the horizontal position.

If in the case of retention relief is not given by the catheter, the urine after the bladder has become full will trickle away. This incontinence is hardly likely to be confused with that due to the presence of vesico-vaginal fistulæ, for on a very superficial examination the bladder would be found reaching to the umbilicus or its neighbourhood, and dribbling from this cause belongs to an earlier date of the lying-in than that due to fistulæ (see p 567).

The urine during the lying-in period contains a great excess of urates, and this is always a very conspicuous feature when the urine has stood for a time. The average specific gravity is unaltered. The quantity is also about the same as usual, being, however, considerably increased if the diet contain an excess of proteids. The chlorides are also found to be increased in a marked degree.[3]

A new substance is often found in the urine of the lying-in woman—namely, *sugar*. This is milk-sugar, and is no doubt due to resorption from breasts. It is present at some time or other in nearly all cases. Its quantity has been found[4] to vary pretty evenly with the amount of milk secreted.

[1] E. S. Tait, 'Some Observations on Puerperal Temperatures,' *Obst. Trans.* vol. xxvi. p. 8.

[2] Probyn-Williams and Cutler, *ibid.*

[3] Winckel, *Lehrbuch der Geburtshülfe*, 2. Auflage, p. 195.

[4] McCann and Turner, 'On the Occurrence of Sugar in the Urine during the Puerperal State,' *Obst. Trans.* vol. xxxiv. p. 473.

The quantity is stated by different authorities to vary between 3·5 per cent. (McCann and Turner) and 1 per cent. (Winckel).

The normal urine may also contain small quantities of acetone, and Fischel describes peptonuria as a constant feature. This last fact possibly has some relation with the involution of the uterus.

CHAPTER XXXII

DIAGNOSIS OF THE PUERPERAL STATE

THE signs that labour has recently occurred are well marked immediately after a delivery at term. The evidence of abortion in the earlier months is far less characteristic, and is not after two or three days to be relied upon as proving previous pregnancy.

After delivery at or near term the clinical signs are good evidence for about a fortnight in any woman; in primiparæ this period may be somewhat extended, owing to the usually greater amount of laceration. For the diagnosis of parity or nulliparity, see p. 67.

General Condition.—The woman is in most cases evidently convalescing, and this condition is naturally the more marked the sooner after delivery an examination is made.

External Examination.—On examining the abdomen the uterus is found enlarged, and the measurements given on p. 209 will be a guide to the date to which the puerperium has advanced; and, if observations are made of the height of the fundus on consecutive days, it will be found to diminish as there described. This is characteristic, for nothing but pregnancy causes the uterus to undergo an enlargement which after removal of the cause disappears so uniformly and steadily.

The size of the uterus may be estimated through the abdominal walls readily for the first week; afterwards not so certainly; for, owing to exaggerated anteflexion or to retroversion, the fundus of the uterus may be below the brim at an earlier period than normal.

The abdominal walls are very relaxed, and are easily pinched up into folds.

The pigmentation in some cases is very marked, more so than at the end of pregnancy, since the lines and spots of pigmentation lie closer together now that the abdominal walls are no longer distended.

The striæ are usually red or purple, and often in multiparæ the striæ belonging to the last pregnancy can be distinguished from the dead white ones of gestations previous to the last.

The breasts will be found knotty or full, according to the stage of lactation reached; and either colostrum or milk can be squeezed from the nipple, flowing very freely as a rule. New striæ also may be seen radiating

from the nipples. It is only in exceptional cases that the milk is scanty during the lying-in period, whatever it may become afterwards.

The *external genitals* may show signs of laceration in varying degrees; the orifice of the vagina is gaping to an extent corresponding to the recentness of delivery, and is much pigmented; and the lochia proper to the period are present.

Internal Examination.—The *vagina* is extremely lax and inelastic. In a primipara the lacerations in the hymen, and especially its base, are recent, and granulations in a more or less advanced condition are found.

The *cervix* is very broad and soft, and for the first day or two the tip of the finger can be passed through the internal os. After then the finger can pass as far as the internal os for ten days or so, and then, if there is not much laceration, may only just be able to enter the external os.

Bimanually, the *body of the uterus*, though enlarged, is fairly freely movable in the pelvis, its mobility becoming more marked as it grows smaller. It may in the earlier days contract on examination, and it lies in an anteverted position, as already described.

The most reliable signs are found in the uterus, the vaginal orifice, and the breasts.

The regular diminution of an enlarged uterus occurs in this state alone. When a large fibroid or polypus has been removed, and this is the only condition which could cause error, contraction and retraction are often very rapid, owing probably to the fact that the uterine enlargement caused by them does not affect the whole of the tissues in the same way as pregnancy does.

The vaginal orifice may have been stretched and lacerated by the recent removal of such a tumour, but as a rule the hypertrophy of the tissues characteristic of pregnancy will not have occurred in this region—the parts will be merely stretched and torn. If delivery has been effected by Cæsarean section or by embryotomy (in the last case especially in a multipara), there will be no characteristic lacerative signs of recent delivery found at the vaginal orifice.

Secretion is found in the breasts occasionally in cases of fibroids, ovarian tumours, and spurious pregnancies. It is in these cases a thin, serous fluid, and is very scanty, and thus differs from that which is present in the puerperal state.

Post-mortem Signs of Delivery, recent or remote

To make the diagnosis of parity complete, these signs may be added here. They consist only of additional points to be noted in the uterus, and affect (1) the shape; (2) its vessels and sinuses. The characters of these last have been already alluded to (p. 213).

1. *Shape.*—The uterus never returns after labour at or near term to its former size. In the case of super-involution of the uterus the organ is smaller than normal, but ordinarily the parous uterus has a cavity measuring nearer 3 in. than the 2½ in. of the healthy nulliparous one.

The alteration in *shape* is the more characteristic sign.

Comparing the outlines of the cavity in a nulliparous (A and B, fig. 232) with those in that of a parous uterus (C, fig. 232), it is seen that the convexity of the lateral wall and of the fundus towards the cavity in a coronal section is much diminished in the latter, and in such a section the cavity is now more broad in outline, and has not the narrow triangular one existing before pregnancy. Seen in antero-posterior section there is no marked difference.

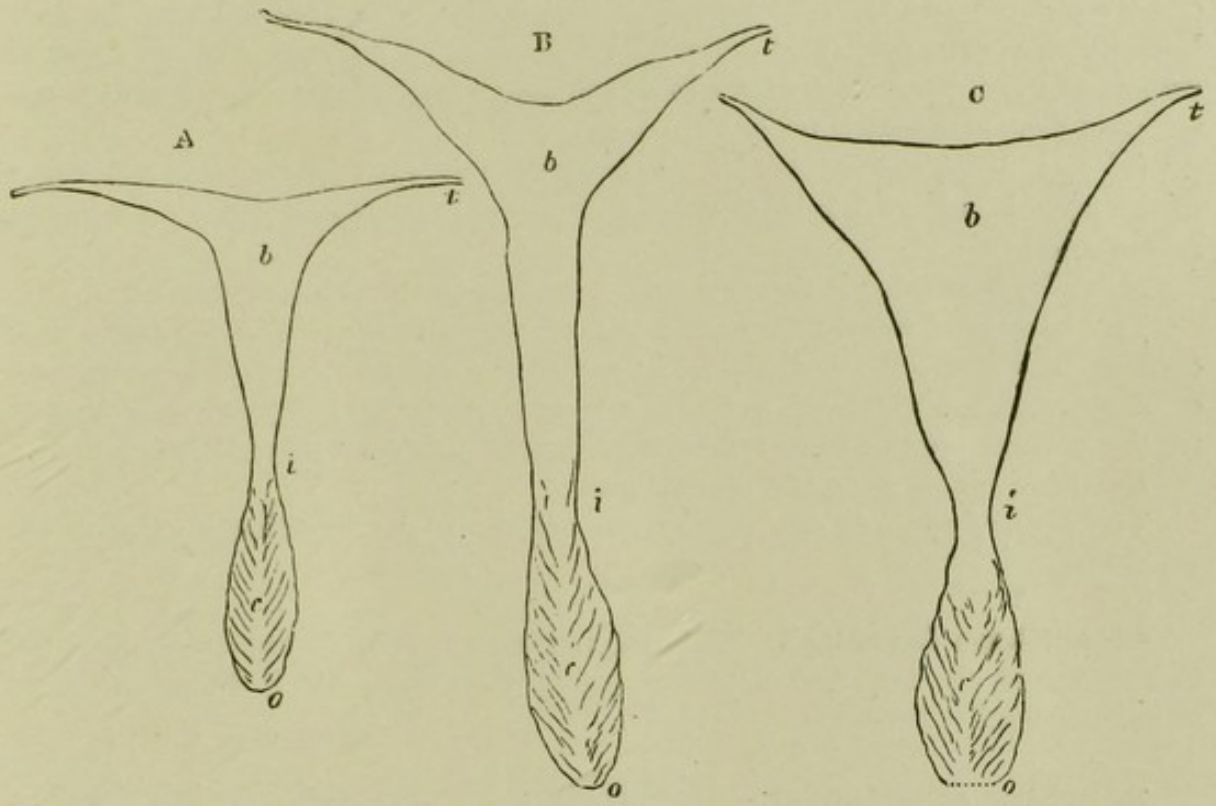

Fig. 232.—Outlines of moulds of the uterine cavity in different states (after F. Guyon). Natural size. A, in a virgin of 17 years of age; B, in a woman of 42 years who had not borne children; C, in a woman of 35 years who had borne children. *b*, cavity of the body; *c*, that of the cervix; *i*, the isthmus or os internum; *o*, os externum; *t*, passage of the upper angle into the Fallopian tube.

The weight of the uterus is increased on an average by a few grains.

The lacerations of the cervix and its other modifications have already been mentioned.

2. *Vessels and Sinuses.*—The permanent changes in the arteries and the structure of a sinus-remains (which are characteristic for at least twelve months) have been described (p. 214).

CHAPTER XXXIII

MANAGEMENT OF PUERPERAL STATE

It will be seen from the foregoing description of the physiology of the lying-in period that the management of it must be simple in its principles; and that, in the absence of interference from without or of previous organic disease, hereditary or other tendency to insanity, this period runs a satisfactory and uneventful course.

Already partially or wholly developed diseases of various organs, such as cardiac disease, or gonorrhœa, or a hereditary tendency to insanity, are conditions whose results can only be guarded against with more or less success ; but diseases due to fresh contamination from external sources can be practically abolished. These consist of septic processes and specific fevers, and the safeguards against them are found in antiseptic measures conscientiously carried out through all the stages of labour. These include both the two principles laid down (p. 180)—namely, (1) care that no material remains in the genital passages in which septic organisms can flourish ; and (2) care that no organisms are imported.

(1) has been carried out by obtaining complete evacuation and retraction of the uterus ; (2) so far by the observance of the laws laid down on p. 184 as essential.

Aseptic cleanliness is the first and most important thing to aim at.

The increased weight of the uterus and the relaxation of its supports now existing, the bruised condition of parts of the genital tract, the exhaustion of the muscular, and especially of the nervous system, all suggest complete rest till the several organs have returned to their condition before impregnation.

Complete rest is then the second aim.

The *breasts* and the *nursing of the child* are the remaining subjects for attention.

Cleanliness (aseptic).—The same precautions with regard to personal cleanliness in doctor, nurse, patient, and instruments are to be observed as in the conduct of labour.

Douching after labour.—In addition, in certain cases antiseptic douches must be given. These cases are :—

(1) Where any manipulation above the level of the internal os has been necessary, or where instruments have been used during the labour.

(2) Where the ovum or other uterine contents have been diseased, and where the patient has had a purulent vaginal discharge before or during labour.

(3) Where there are other lying-in women in the same room or ward. Under any one or more of these circumstances it is necessary for the patient's safety that a vaginal douche of some reliable antiseptic solution should be used at regular intervals for a few days after labour. The best solution is, unless mercury is contra-indicated, one of perchloride of mercury of a strength depending upon circumstances, this being usually from 1 in 4,000 to 1 in 8,000.[1] Two quarts of this solution should be used morning and evening, a douche-tin always being employed where obtainable.

Administration of the douche.—To administer the douche the patient should be made to lie on her back with her shoulders raised. The bed slipper is then arranged beneath her, and the tin is suspended about three

[1] Mercury is contra-indicated in cases where renal albuminuria is present ; where the patient on other occasions has shown herself specially susceptible to mercurialism ; usually where diarrhœa is present ; and of course mercurial douches must at once be discontinued on the appearance of any symptoms of poisoning. These are : spongy gums, foul breath, diarrhœa, and abdominal pains.

feet above the level of the bed. A small quantity of the fluid should be allowed to run off before the nozzle is introduced into the vagina, so as to expel any air that may be in the tube, and any solution which has become cold in the tube. The temperature of the douche should be from 108° to 110°. The nozzle is passed for about two inches into the vagina and the tap turned. The left hand of the person giving the douche must be laid over the uterus on the abdominal wall, so as to guard against distension by the solution, for some of the fluid often finds its way into the uterus even when the patient is in the semi-recumbent position, and if it is retained there for several hours may be a cause of symptoms due to the absorption of mercury. Further, in some cases, the solution has found its way through the tubes into the abdominal cavity and has caused rapidly fatal results.

Retention is more likely to occur in the vagina, especially if the perinæum is still intact, or, at all events, has still sufficient tone to more or less completely close the vaginal orifice. Retention is prevented by pressing firmly down on the fundus at the end of the douche in the axis of the brim and by at the same time depressing the perinæum with the nozzle or with the finger. There are several kinds of nozzle, the one in most general use being the red gum-elastic tube usually supplied with a Higginson's syringe. A glass nozzle is a much better instrument in the lying-in room, for it can be kept absolutely clean and aseptic, whereas there is no such certainty about the other. There should be no central perforation at the extreme end of the nozzle, whichever kind be used, since a powerful stream may find its way through this hole to the uterine cavity. There is no need to use any modification which allows of a return current either through, or by the side of, the nozzle when merely vaginal douching is employed, because the nozzle is not gripped by the vaginal orifice in the way it may be by the cervix after the first few days.

Carbolic acid (1 *in* 60), or a saturated solution of *boracic acid*, may be used, instead of corrosive sublimate. Condy's fluid is not so reliable.

If vaginal injections are made at all, it is certainly safer to use some form of antiseptic in the douche, as there is always a possibility of carrying infectious matter from the parts about the vaginal orifice into its deeper recesses or even into the uterus, either on the nozzle itself or by the stream of fluid. This will not occur if the rules already laid down as to cleansing the vulva are adhered to ; but no safeguard should be neglected, and a reliable antiseptic will destroy such infectious matter.

In some of the cases above mentioned (especially in (1) and (2)) it is often desirable to give an *intra-uterine* douche after the delivery of the placenta and membranes, so as to wash away or destroy any septic matter which may have entered the uterus during labour. If given hot, at a temperature of 115° to 118° it acts also as a powerful stimulant to the uterus, and thus aids asepsis in two ways. The douche should be administered in the same manner as that above described for the vagina. A different nozzle, however, may be employed, the best one being Budin's uterine catheter made of celluloid or glass, though the cervix is at this time sufficiently lax to allow the fluid to escape if an ordinary long tube is used. Budin's is practically a flat, wide tube, folded in its length so as to form a semicircle on cross-section (fig. 233). The fluid returns under the arch made by the folding, and this channel cannot be

occluded. Glass has the advantage of ensuring greater cleanliness, but is, of course, more easily broken. A short length of india-rubber tubing should be fitted to the butt end of the nozzle, and this can then be slipped over the bone or vulcanite end of the tube attached to the douche-tin.

Supposing the labour has been perfectly normal, and that only one or two vaginal examinations have been made, it is a question whether douches should be given at all. The results in some hospitals abroad, even with many women lying in one ward, have been as good as possible without any douching whatever. The outcome depends very much on how far strict asepsis has been observed in the conduct of labour; and in the above-named cases the success has been attained in the absence of vaginal examinations of any kind, the whole labour having been superintended per abdomen.

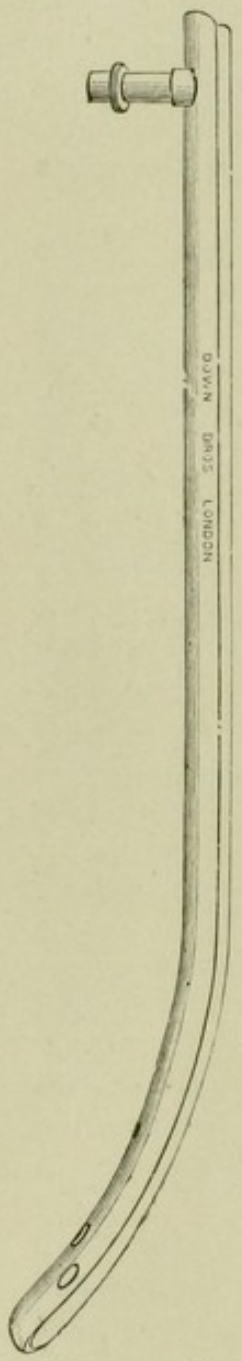

Fig. 233.—Budin's catheter.

In view of these results in lying-in hospitals, it is obvious that in private practice douches can be safely omitted after normal labours, and in the absence of the conditions already detailed. It is also perfectly true, however, that most patients feel far more comfortable and refreshed after each douche, and that often clots are washed away by the fluid which might have remained in the vagina for some time and possibly have done harm.

It may be said, then, that a weak antiseptic douche, though not essential, may with advantage be given once a day, if not twice. A good solution is 1-10,000 perchloride of mercury, or boracic acid ʒj to a pint, or tr. or liq. iodi ʒss to a pint, or carbolic 1-60 may be used.

If the nurse is inexperienced, it is safer to omit the douche and be satisfied with external cleanliness.

The external genitals are to be washed twice daily, before the douche if this is given, with soap and water, and careful attention is to be given to the pubic hair, for it is liable to entangle small clots and particles of mucus.

All soiled linen must be at once removed from the room, according to rules already laid down.

A draw-sheet should be used for the first two or three days, and a fresh surface should be placed beneath the patient after each washing, or a fresh wood-wool sheet may be used each day. During the washing and the douching, in addition to the bed-slipper, a thick absorbent towel should be placed beneath the patient, and if soiled should not be used again.

The patient will need to wear an absorbent pad of some kind over the vulva as long as any lochial discharge persists. The best material for this is wood-wool impregnated with a small percentage of corrosive sublimate. These pads can be obtained ready for use. The pad will have to be changed frequently during the first day, the number soiled each day becoming less and less. They are burnt at once after use. The total number will vary much in each patient, an average for the whole fortnight being three to four dozen.

Other materials may be used for the pads. Some patients find the wood-wool pads uncomfortable, and in that case 'flannelette' folded into two or three layers is very satisfactory.

The lying-in woman should try to manage without a pillow for the first twenty-four to forty-eight hours, unless its absence causes her discomfort. Otherwise the tendency is for the pelvis to lie considerably below the level of the rest of the body, and congestion of the lax and possibly lacerated parts is thus promoted.

Binder.—It is always better to use some sort of a binder, though in the opinion of many it is not essential. The binder affords some support to the abdominal walls in their relaxed state, giving them rest and promoting their involution, and it makes the woman more comfortable. It is certainly not such a vital part of the management of the lying-in as some women suppose, and accusations of incompetence made against the nurse on the ground of her failure in retaining the patient's previous figure because she had not applied the binder properly are not to be listened to. At the General Lying-in Hospital the method of application of the binder is as follows:—The binder should consist of huckaback towelling, 36 in. wide, and a yard and a quarter long, doubled lengthways. Its lower edge should reach four inches below the top of the thigh-bone (great trochanter). The free end of the binder should be uppermost on the right side. Starting from the left flank, the binder should pass over the abdomen, round the back, and again over the abdomen, ending on the right flank, where, after it has been tightened, and all creases smoothed out, it should be securely fastened by four strong pins. The patient's skin should be guarded by the left hand beneath, and the pins inserted in the following order, beginning from below—one at the lower end of the binder, three inches below the top of the thigh-bone, and a second a similar distance below the top of the hip-bone, both fastening the binder tightly, serving to keep it in position and preventing it from riding up. The third should hold the binder still more firmly on a level with the top of the womb; and a fourth near the upper edge of the binder, not too tightly applied, completes the series.

This will be worn until the woman is considered fit to get up. It will have, of course, to be changed occasionally, and at once on its lower edge being in the least soiled.

The ventilation and lighting of the room have been already alluded to (see p. 180).

The patient should be allowed to sleep as long as she will after labour. No excitement of any kind must be permitted; and the lying-in woman must not interview friends; the husband even should only see her once for a few minutes on the first day. On the second, if all is well, two visits may be allowed, but should not exceed ten minutes each. The patient should have no household affairs to think about for the first few days.

There need be no restriction placed on the woman's movements in bed. She is not likely to want to move much, and changes of position are useful rather than otherwise, as they help the circulation in the pelvis, and add to her comfort.

Rest in bed.—The woman should if possible remain in bed for a fortnight at least; and if she has been lacerated, until all the tears are healed;

though she still must not be confined to one position, but move about in bed.

After this she can lie outside the bed for a day or two, and then be carried on to a couch, where she must pass a good deal of her time for the next fortnight or so.

Of course different lengths of time are required to be spent in lying-in by different patients ; and each must be judged on its merits. The patient should never be allowed to become tired ; and if this happens more time should be spent in lying down.

If the lochia become red the first time she gets up, she must go to bed again for a day or two in any case, and must stay there until the discharge becomes again free from blood. Greater care than usual should be exercised afterwards in deciding when she can move about more freely.

Diet.—The patient will, as a rule, do very well on milk, a cup of tea, and a basin of soup for the first day. The milk can be taken plain, or made into a custard or otherwise cooked. On the second day she may have fish or chicken ; and if all goes well, anything she likes on the third day. No attempt at a low diet should be made at any time ; the only reason light food is given on the first day is that the most easily assimilated nourishment should be used.

Milk should always form a large proportion of the lying-in woman's diet ; though if she does not nurse the baby for any reason (see below) this rule may be neglected, and the diet then should not be too nutritious.

Bowels.—The sluggishness of the bowels is a reason for administering a purge on the second or third day ; usually this is left until the third. Any aperient the patient prefers, provided it be not too strong, may be used, or an enema may be given.

Micturition.—If the patient has retention of urine (see p. 567) a catheter must be used with the strictest antiseptic precautions, since no doubt catheterism is a frequent cause of cystitis. This complication need never occur if no infective material is carried into the bladder by the instrument. The catheter should be passed every six hours, the patient in the meantime making attempts to pass water without it. She should, directly the uterus has proved itself safely retracted by relaxing without hæmorrhage, begin to pass water kneeling in bed, and the nurse must help her into this position.

A lying-in woman should never be allowed to have a full bladder, for it causes the uterus to retrovert, and this retroversion may in some degree hinder involution.

Pulse and Temperature.—The nurse will keep a careful morning and evening record of the pulse and temperature ; preferably on a chart.

The possible causes of any sudden rise of temperature will be borne in mind (see pp. 562 and 569). If the rise is due to confined bowels a purge should be administered ; if to excitement, a dose of bromide may be given if considered necessary ; if to tension of the breasts, this must be relieved, and a purge is here also most useful treatment.

If the rise of temperature is due to septicæmia or sapræmia (see p. 527) ; this will be mainly shown by its persisting over twenty-four hours, and by the general condition of the patient.

Afterpains.—If these are moderate in severity, and only last for the first twenty-four or forty-eight hours, and the uterus diminishes in size in the usual manner, the patient should be encouraged to bear them, and should be informed of their value in expelling clots and favouring involution. If they are very frequent or severe, and seem to be wearing her out, some anodyne may be used, provided there is no reason, such as profuse lochia or a persistently large uterus, to suggest retention of any part of the placenta or membranes.

The afterpains are usually severe where the uterus has been over-distended by twins, or by hydramnios ; and in the case of women who have had large families and have an enfeebled uterus.

If treatment is required, hot fomentations or equal parts of glycerine and extract of belladonna spread on lint may be applied to the abdomen. Opiates internally are to be avoided, as they tend to prevent the uterus from contracting ; and if the afterpains are caused by clots, the expulsion of the latter is interfered with.

In many cases two or three full doses of ergot (℥ss of the ammoniated tincture) at short intervals, say of four hours, will be found a good form of treatment. However, if there is no question of retention of clots or other solid matter, and no considerable tenderness on palpation of the uterus per abdomen, and the pain is due merely to a colicky and irregular uterine contraction, ℥ss doses of tr. hyoscyami in liquor ammoniæ acetatis or some mixture of the kind may be given, and the bowels made to act. Antipyrin and phenacetin have been found useful in a very large number of such cases ; and a trial should always be made of them before any sedative is given.

The systematic administration of ergot during the whole of the puerperium has been advocated by some authorities as tending to promote involution and diminish the retention of clots, and thus the afterpains caused by them. There is, however, insufficient evidence of any such advantage ; and ergot steadily administered rather tends to produce tonic contraction of the uterus than to promote the physiological state of alternate contraction and relaxation.

Lactation.—The child should be nursed by the mother, at all events for the first three months, in all cases where there is no pathological reason to the contrary. Phthisis, recently acquired syphilis, or depression of health from any cause, and certain conditions of the breasts, are contra-indications to nursing.

It would naturally be expected, and it is true, that its own mother's milk is the best food for a child. In the mother's interest it is probably also better, for the application of the child to the breast stimulates the uterus to rhythmical contraction and thus it may be expected to more rapid involution. Observations made on the rate of involution in cases where the woman has or has not nursed her child do not, however, prove any such influence.

Time and frequency of Suckling.—During the first day and until the milk-secretion is established the child should be put to the breast for a few minutes three or four times only in the twenty-four hours. The child obtains some slight nourishment from the colostrum and this also acts as a natural aperient for it. It is better for the breasts too, for they are stimulated, and the ducts are cleared ; and this tends to prevent the painful distension of the lobules which

is often due to blocking. The nipples, too, are drawn out. After the milk has begun to flow freely the child should be suckled every two or three hours for ten minutes during the day. The baby must not be awakened for this purpose, but must wait until the next regular time. It will soon acquire the habit of being hungry at the proper time.

In the night the mother should sleep from 11 P.M. till 5 A.M.

As the child gets older and its stomach larger, the intervals between the times of nursing should be increased, so that at the end of a month they should be of four hours' duration.

The breasts should be used alternately during the day. After each meal the baby's mouth must be wiped out with a clean linen rag moistened with a solution of borax (℈j to a pint of water) ; and the nipples should be treated with the same lotion, and carefully wiped dry.

During suckling the mother should depress the part of the breast around the nipple with the fore and middle fingers, so as to enable the child to breathe with ease. If it cannot breathe easily, it has continually to drop the nipple to take a breath, and this tends to rub off the epithelium and lead to sore nipples.

The child should under no circumstances be allowed to remain in its mother's bed during the night, or when she is likely to sleep, for it may then be 'overlaid'—that is, smothered. It will also be constantly sucking at irregular times, both spoiling its own digestion and giving the mammary glands no rest ; for it will be remembered that the breasts normally secrete only when they are stimulated by suckling ; and in the absence of this stimulation are at rest.

The cases in which the mother should not suckle her child fall into two groups. (1) For reasons relating to her own health, nursing is contra-indicated by

Severely cracked nipples.
Mammary abscess.
Depressed nipples, which cannot be sufficiently drawn out after repeated attempts.
Marked anæmia
Phthisis in any stage.
Acute fevers, septic or specific.

(2) for reasons relating to the child.

Very scanty milk.

Recently acquired Syphilis of the Mother.—Old syphilis of the mother acquired before pregnancy has already infected the child, and the latter can take no harm if there are no lesions about the nipple. If, however, the infection is recent, the child may have escaped while in utero, and no risks should be run of infection by the milk or by sore nipples.

Cases where the child cannot suck owing to weakness or malformation will be dealt with later.

If the breasts yield only a small quantity of milk at first, it is well for the mother still to try to nurse the child, for the quantity often increases to the

full amount necessary, especially if her strength is well supported by a generous diet, including much milk and a moderate quantity of alcohol, and possibly a full amount of proteids.

Scantiness of milk occurs rather more frequently in very large breasts (the bulk of which is made up of fat) than in smaller ones ; the external appearance being no criterion of the amount of gland substance.

It may here be stated that local applications are absolutely useless, and that, other things being equal, the amount of milk secreted depends on the general health.

Care should be taken to keep the breasts and nipples in the best possible order. Any cracks or excoriations should be attended to at once, for in most cases where mammary abscess develops they are the channel through which the organisms find entrance. They will rarely occur if the precautions detailed above are observed.

If they do make their appearance, the nipple should be carefully washed with carbolic lotion 1–60 after each nursing, and an application of equal parts of glyc. ac. tannic. and a 1–20 solution of ac. carbolic. made on a small piece of absorbent wool until the next time for suckling. This must be washed off before the child takes the nipple into its mouth. If the cracks become very severe and painful, nursing must be given up. For fuller details on this subject, see p. 570.

A nipple-shield will in slight cases be found a useful protection, and will prevent much pain and some bleeding. The shield should be kept in a solution of equal parts of sulphurous acid and water when not in use, and washed in plain boiled water before it is applied.

In the case of cracks which bleed readily the child may swallow some of the blood and subsequently vomit it. This is a possibility which should be remembered, as if it were forgotten it might suggest serious disease on the part of the child.

Cracks are important not only on account of their immediate effect, but also, as just stated, on account of their becoming a channel for the admission of septic organisms to the tissues.

Engorgement of Breasts.—If about the third day the breasts become painful and lumpy, all dried secretion which might cause blockage of the orifices of the ducts should be carefully removed from the nipples. Hot fomentations either of water or of olive oil may then be applied ; and very gentle stroking of the lumps towards the nipple with a lubricated finger should be practised. Some of the milk should be evacuated, either by the child, or, if it is not strong enough, by a breast-pump. The breasts should be supported by a bandage if they are at all heavy and pendulous. A napkin arranged under the breast and across the opposite shoulder answers very well. A saline aperient should be given.

In cases where owing to the child's death or from maternal causes (see above) it is desirable that the secretion of milk should cease, the woman should be put on a lower diet than that described above, and no attempt made to draw off the milk. The bowels should be freely opened with a saline purge, a pretty firm pressure should be applied by bandages uniformly adjusted over the breast, avoiding the nipple ; and the breast should be previously covered by a piece of lint smeared with glycerine and belladonna,

a hole being left for the nipple. The nipple is covered with a pad of absorbent wool, which is renewed as it becomes soaked with milk. The child must never have the breast again, nor must the breast-pump be used when once this treatment has been begun ; for the latter procedure rouses the gland to activity, and the child if nursed runs the risk of being poisoned by the belladonna.

THE NEW-BORN CHILD

CHAPTER XXXIV

PHYSIOLOGY AND MANAGEMENT

Physiology

The changes from the fœtal to the adult type of circulation which occur at birth may be here described.

The course of the blood in the fœtus differs from that in the adult, mainly in the absence of the pulmonary circulation.

Starting from the abdominal aorta, its course is as follows : (fig. 234). It passes through the hypogastric arteries, which arise from the internal iliacs, and are continued as the umbilical arteries (*U A*) into the placenta (*P*). It is there aërated, and returns through the umbilical vein (*U V*) to the abdomen of the child. The umbilical vein divides on the under surface of the liver into two branches ; one, the *ductus venosus* (*D V*), joins the inferior cava, while the other unites with the portal vein (*Port*) and sends its stream through the liver, the blood afterwards joining that in the vena cava by means of the hepatic veins (*H V*). More blood goes through the liver than through the ductus venosus, and in the diagram the latter is drawn too large.

The inferior cava opens into the right auricle (*R A*), and its blood is directed across the auricle by the *Eustachian valve*, shown in fig. 235, to the *foramen ovale*, through which it passes into the left auricle, as shown by the arrow. It thus escapes the pulmonary circulation, and finds its way immediately into the left ventricle, passing on into the aorta, and being distributed to the head and arms.

Returning to the right auricle ; the superior cava conveys the blood coming from the head and neck and upper extremities, which is entirely venous blood, into this cavity at its upper and outer angle. The stream then passes in front of the Eustachian valve into the right ventricle. This venous stream crosses the aërated one of the inferior cava (see fig. 235). On reaching the right auricle, the blood is forced into the pulmonary artery, *P A* (figs. 234 and 235). A very small quantity, *P A* (fig. 234), merely enough to nourish the as yet unexpanded lung, is diverted from the main current, which latter passes on through the *ductus arteriosus* to join the aorta below where the left subclavian artery is given off. It there mingles with the blood, originally from the inferior cava, which has passed through the left ventricle. The

supply of aërated blood to the head and arms is thus given off before this venous blood joins the aortic stream. The mixed blood is then supplied to the trunk and lower limbs, but the greater part of it goes to be fully aërated in the placenta.

On looking at the scheme of the circulation (fig. 234) it will be seen that there is fully aërated blood in the umbilical vein only, and fully deoxygenated blood in the vena cava superior, in the part of the vena cava inferior below where the ductus venosus joins it, and in the veins from the viscera. The rest of the blood in the main trunks is mixed blood.

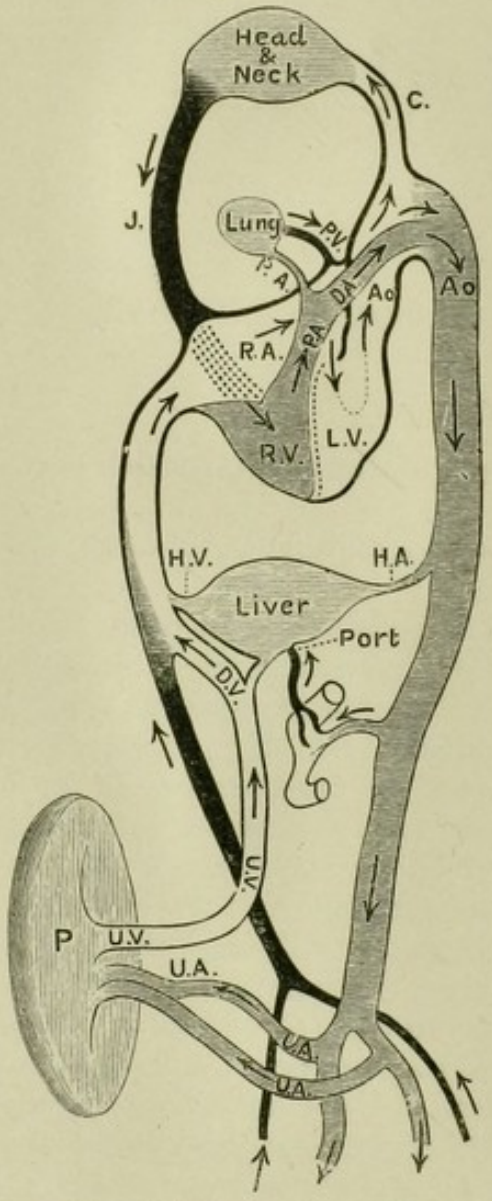

Fig. 234.—Fœtal circulation. *C*, carotids; *J*, superior cava; *P A*, pulmonary artery; *P V*, pulmonary vein; *R A*, right auricle; *R V*, right ventricle; *L V*, left ventricle; *D A*, ductus arteriosus; *Ao*, aorta; *H A*, hepatic artery; *H V*, hepatic vein; *Port*, portal vein; *D V*, ductus venosus; *U A*, umbilical artery; *U V*, umbilical vein; *P*, placenta. The branch from the *D V* should join the portal vein before entering the liver.

In the later months of pregnancy there is less marked separation between the two currents in

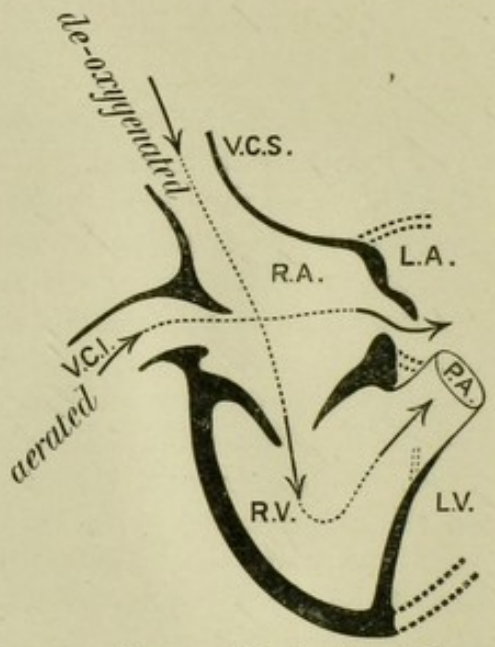

Fig. 235.—Scheme of right side of heart. *V C I*, vena cava inferior; *V C S*, vena cava superior; *P A*, pulmonary artery; ventricles and auricles marked right and left, *R A*, *L A*, *R V*, *L V*.

the right auricle, and the blood passing through from the upper cava and on into the pulmonary artery, ductus arteriosus and aorta is better aërated. The lower limbs are consequently better nourished, and grow more rapidly than at first.

When the child is born and the placenta is detached, the child's system feels an immediate want of oxygen, and by the reflex action of the respiratory centre the first breath is taken. The stimulation of the skin by the cold air helps to make the child give its first gasp, and may, unfortunately, do this occasionally before the respiratory passages are free; as, for instance, in a

breech delivery before the head is born (see Asphyxia Neonatorum, p. 518). When the first inspiration is made the lungs expand, and with them their capillaries. This causes at once a large quantity of blood to pass through the pulmonary artery direct to the lungs, and very much less through the ductus arteriosus, in which the pressure is correspondingly lowered. The large quantity of blood is returned to the heart through the now expanded pulmonary veins (*P.V.*), and the pressure in the left auricle is increased to one at least equal to that in the right auricle, which on its side is diminished by the withholding of the placental blood, for the now detached placenta has its circulation very greatly diminished. The stream through the foramen ovale thus ceases, and the valve begins to close.

The ductus arteriosus gradually closes owing to the diminished pressure in it. The pressure in the aorta is consequently lowered, since it has the force of only one ventricle behind it ; and now that the placental circulation is abolished, the hypogastric arteries diminish down to the size at which they are found in the adult.

The temperature at birth is a little higher than the maternal one—namely, about 100° F. It becomes slightly lowered soon afterwards, averaging about 97·5° in healthy children, and then again in a few hours rises to the adult normal temperature. A fall of 3° or 4° F. may sometimes occur, but if this is not soon recovered from, it is of bad augury for the life of the child and shows deficient vitality. The daily range amounts to about 2°, the highest point reached being at 5 to 6 P.M.

Pulse.—This is about the same as in utero ; the respirations are at about 44 per minute.

Urine—This secretion is of low specific gravity, about 1012 at the very first ; afterwards about 1004 for the first few weeks.

It contains less urea than that of the adult, but a large proportion of uric acid. It is cloudy at first, but becomes pale and clear after the first few days. It is passed ten or twelve times daily and amounts to about 10 oz. in the 24 hours, a considerable quantity in proportion to the child's size. Exact investigations are, however, extremely difficult to make, as the urine requires special arrangements for its collection.

Traces of albumin are not infrequently found for the first six days or so

Albumin is considered by some (Dohrn and Virchow) to be a post-mortem phenomenon ; but Martin and Ruge are of opinion that it is normal in most cases, and that the kidneys of the newly-born are always in a hyperæmic state, sharing this peculiarity with the lining membrane of the large serous cavities, the bronchi, and the endometrium.

The urine contains at first some epithelial cells from the bladder and the rest of the urinary tract, including the pelvis of the kidneys ; uric acid in rhombic plates; urates, uric acid infarcts; and occasionally hyaline casts.

All these points of difference from adult urine (except the low specific gravity) disappear after the first week or so.

Alimentary System.—The stomach is ready to deal with food long before full term, and pepsin has been found in it as early as the third or

fourth month. Soon after it becomes active it assumes the adult position, *i.e.* one nearer the vertical than that in which it lies before this. It holds only one to two fluid ounces at birth (fig. 236), but soon increases in capacity. The salivary glands have not attained their full development in the power of starch-conversion, and do not attain it for the first three or four months of independent life. The pancreas is able to digest fats and albumin.

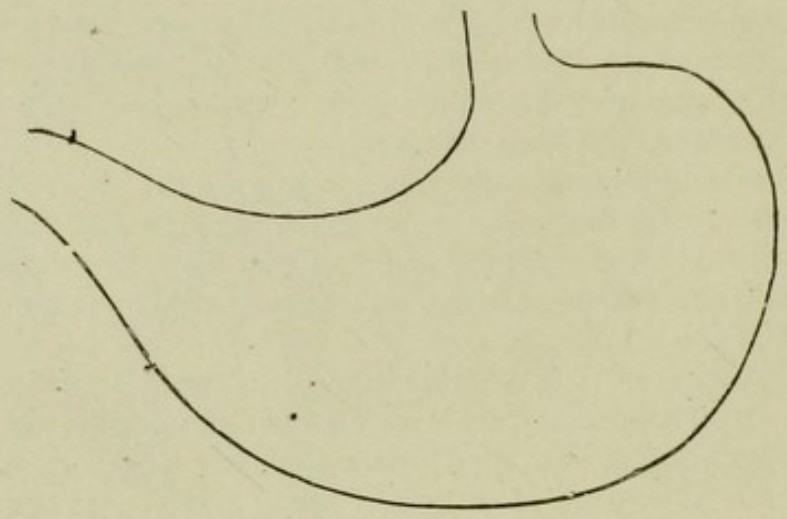

Fig. 236.—Stomach of a newly-born infant (natural size). (Ashby and Wright.)

For the first two days the bowel expels only meconium, a dark green substance which consists of mucus, bile-pigments, cholesterin, and epithelium. This is in three or four days gradually replaced by the characteristic yellow semi-liquid fæces of the infant. Motions are frequent, occurring every few hours.

Loss of Weight.—Owing to the free secretion of urine and discharge of meconium in the absence of renewal of supply, the child loses weight for the first three or four days. This loss is only a few (2–3) ounces, if the cord has been ligatured late, as advised, but after immediate ligature it may be as much as half a pound. When the food-supply is established, it picks up what it has lost by the end of the week, and thence onwards gains rapidly in weight, and makes roughly about an ounce a day.[1]

Skin.—The redness of the skin of new-born children passes on to a desquamation, which begins about the third or fourth day and proceeds for about a week. The change from red to yellow which the skin undergoes during this period may, as Spiegelberg has pointed out, be mistaken for slight jaundice. It begins on the trunk and lower limbs, and ends on the face and arms.

A real yellow staining of the skin does occur in about 25 per cent. of all newly-born children. It is called *icterus neonatorum* (see p. 581), though the term icterus is perhaps not strictly applicable to a staining which attacks

[1] Schmidt (*Arch. f. Gyn.* vol. xliv., 1894) finds that after fourteen days the average daily increase of weight in children after immediate ligature is under half an oz.; whereas after late ligature it is about 1⅜ oz. a day.

nearly always the skin alone, not so often involving the sclerotics, and never colours the urine, nor decolourises the fæces.

It must not be imagined, however, that all cases of jaundice in new-born children are of this innocent kind. There may be real danger in connection with this symptom, and the description of cases where this is so will be given later.

The yellow colouring now under consideration usually lasts about five to six days, beginning about the third.

Nervous System.—The life of the new-born child is divided between sleeping and feeding.

Consciousness is absent, and existence is entirely carried on by reflex agencies, or by these guided to some extent by inherited experience. Sucking is a combination of these two modes.

The child's general sensibility is very low, and the special senses are undeveloped, the organs requiring to be educated. Hearing is said to be the last acquired sense; the tympanum at birth has no cavity. Sight only to the degree of distinguishing darkness from light is present in the first week. There is usually a good deal of squint, from want of co-ordination of the eyes.

Umbilical Cord.—This gradually dries and shrivels up, becoming brown in colour, and, if not kept aseptic, unpleasant in smell. It is separated by the process usual to dead tissues—the formation of a line of demarcation, and granulation at this level. The level is that of the junction of the skin and amnion, where there is to be found a ring of capillaries. The stump falls off in about five days, and healing rapidly occurs after this process has taken place. The surface is at first pretty flat, but contracts as it heals and assumes its well-known depressed appearance.

The other remaining evidences of fœtal life, or, rather, of the period of labour, are the *moulding of the head and the caput succedaneum.*

Both these distortions disappear completely as a rule by the third or fourth day, so that in measurements taken on the fourth day the original shape of the head in utero is reproduced; and with these the measurements taken immediately after birth may be compared, and the amount of distortion estimated.

There remain to be noticed two slight abnormalities, which occasionally arise in the first few days of new-born life.

One is a *swelling of the rudimentary mammary glands.* In children of either sex indifferently, these organs may become swollen and tender, and may secrete a little serous fluid, which is sometimes almost as opaque as colostrum. This condition subsides, if the breasts are left alone, in a couple of days or so. It occurs within the first few days of life, and is, no doubt, connected with the increased activity shown by the skin at this time.

The other abnormality occurs in female children only, and consists in a *discharge of blood from the vagina.* This probably occurs without any lesion of uterine or other surface, and is merely part of the general congestion described by Martin and Ruge and mentioned above.

It happens in about one in 40 or 50 cases, and lasts one or two days.

This symptom again may be part of a serious disease; it may be combined with melæna and other hæmorrhages (see p. 582).

Management

When the mother has been left in a satisfactory condition after the end of labour the nurse must turn her attention to the child, which has been left wrapped up in flannel in a safe place, breathing normally. Its various organs, orifices, and limbs should be first carefully examined.

The *eyes*, if not attended to before, should be very carefully washed with clean warm water, to guard against ophthalmia, and if there is a suspicion of any purulent vaginal discharge in the mother, a solution of perchloride of mercury (1–2000) should be dropped into their outer canthi. Credé, who was the first to advocate and to prove the value of this practice, used a 2 per cent. solution of nitrate of silver in every case.

It must now be washed in water of the temperature of 96° F., never hotter, and the washing should be done in front of a fire. The vernix caseosa, if very plentiful, may be removed with a little oil, and then soap (which should be free from excess of alkali) applied with a piece of soft flannel. The friction must not be too vigorous.

When the surface is quite clear and all the creases attended to, it must be well powdered with starch and oxide of zinc powder, or pure boracic acid ('Sanitary Rose Powder').

The *cord* should be passed through a hole in a square of some antiseptic gauze, and after it is clear that no bleeding is occurring from it, covered with the powder, one or two teaspoonfuls being dusted on to it. The gauze is then folded over so that the cord turns upwards on the abdomen, and a flannel binder five inches wide is firmly, but not too tightly, adjusted over all.

The *clothing* should cover the limbs and not be too tight, and no pins should be used. The buttocks should be smeared with cold cream or vaseline each time before the napkin is put on.

In the *after management*, care should be taken after the daily washing to dry it thoroughly, and to powder all the flexures and wrinkles carefully.

The cord must be examined every day and its dressings renewed. After it falls off, its site should be carefully protected until it is quite healed.

Care must be taken to renew the napkin frequently. Soiled napkins must be immediately removed from the room.

If there is any difficulty in micturition, a warm bath often removes this; and a careful examination should be made for any abnormality of the external genito-urinary organs.

Feeding.—The frequency and other details of suckling have been already dealt with, and also the strict necessity for the child's not remaining in the mother's bed, but sleeping in a bassinette.

If, unfortunately, the mother is unable to suckle her child for the reasons given above (p. 232), *a wet-nurse* is the best possible substitute for her, and no artificially-made food is for a moment to be compared in value with the milk of a healthy woman.

The Wet-Nurse.—There are some points of importance in selecting such a person.

(1) She must be healthy. She must be carefully examined for every sign of syphilis at any stage. Her obstetric history, especially as regards miscarriages, must be particularly inquired into.

The existence of tubercle in any form, or a strong family history of it, at once disqualifies a woman from acting as wet-nurse ; anæmia, if marked, is a disqualification, for the milk is usually of a poor quality, and the woman may have to give up suckling after a week or two, thus necessitating a fresh nurse, and disturbance to the baby.

The best age is from 22 or 23 to 32 or 33, and it is better that she should have had a child before the present one, so as to have learned how to manage the nursing.

(2) Her own child must be healthy. This is a very important matter, for if her baby is unhealthy it probably has either some hereditary taint, or its mother's milk must have disagreed with it ; that is, if it has been fed on nothing else.

Signs of syphilis are to be looked for in the shape of eruptions on the buttocks. Ophthalmia, convulsions, diseases of the umbilicus, hæmorrhages from various mucous tracts, aphthæ of mouth, jaundice, rickets, all need a most careful inquiry into their causes, and a consideration of the possibility of injury to the foster-child.

(3) Age of her child. This should correspond fairly closely to that of the baby to be substituted for it, since the composition of the milk alters slightly, as has been mentioned, as the lactation period advances. If there is any difference, it is found best for her child to be a little older, for then greater opportunity has been given for syphilitic rashes to appear, and the nurse has acquired some experience.

(4) Her breasts and nipples must be well formed. Both sides should be examined carefully, and the nipples should be capable of being easily seized and not tender or retracted. The breasts must not be too fat, as such organs do not as a rule yield so much milk as those only comfortably padded ; and the excess of fat may prevent the child from breathing comfortably during its meals.

(5) The milk should flow freely on squeezing the breasts, but should not run away continuously. If it is thought well to analyse it, the normal standard is given on p. 242.

It will be seen in a week or so whether the baby is thriving on its wet-nurse's milk.

Children often do not take to a strange breast at once, so a fresh nurse must not be procured until the existing one has had a week's trial. If after that time there is any digestive disturbance, such as vomiting, diarrhœa, or restlessness, the nurse should be changed. If the wet-nurse has been accustomed to hard work and poor food, she should not be encouraged or allowed to eat large rich meals, drink quantities of stout, and do absolutely nothing all day ; but should be fed very sparingly at first, with no alcohol as a rule, and should take enough exercise to prevent her from suffering from over-eating.

Artificial Foods.—If a wet-nurse is not to be employed on account of the expense, or of objections on the mother's part ; or if the mother is able to suckle to a moderate extent, but not sufficiently for the child's wants ; or if the child is syphilitic, in which case it would be criminal to allow a wet-nurse to risk being infected ; then some more or less artificial food has to be contrived for the baby. It stands to reason that the more nearly the substituted food resembles the mother's milk, the better it is likely to agree with the child.

Cow's milk is nearly always the raw material out of which such a substitute will be made. Before deciding how this is best done, it may be mentioned that the ass, mare, and goat yield milk that has a nearer composition to human milk than that of the cow, and any one of these may be used if it is easily obtainable ; but practically, cow's milk can be made quite as suitable.

For a healthy child, milk is the only diet admissible for the first six to eight months ; and it is in exceptional cases alone that any other food, even 'malted' food, should be used until the end of that period.

Ignorance, or non-observance, of this rule is the cause of more than half the alimentary diseases of children.

The child during the first weeks of life has little or no power of converting starch into sugar ; and foods such as arrowroot, boiled bread, rusks, and so on, which consist almost entirely of starch, are quite inadmissible, since they either pass through the alimentary canal unchanged, or undergo acid fermentation, acting in either case as irritants to the mucous membrane.

If we compare the composition of cow's milk with that of human milk we see by the table that cow's milk contains more proteids in an equal bulk than human milk does.

	Proteids	Fat	Sugar	Salts
Human	1–2	4	7	·2 per cent.
Cow's	3·4	4	5	·6 „ „

We see also, however, that dilution alone will not effect what is wanted, for the sugar will then, being already below the required percentage, be reduced further, and if enough water be added to bring the proteids down to the human standard the fat will be too much reduced.

In addition to the difference in composition as shown by the above table there are other important points to be mentioned.

The proteids of either milk are of two kinds : one, caseinogen, which coagulates into curd on the addition of 'rennet,' and in the stomach ; and the other, lactalbumin, which coagulates on boiling. Cow's milk contains much caseinogen and little lactalbumin ; in human milk (and in ass's) this relation is reversed. The curd formed in cow's milk is much more solid than that of human milk. The latter curd is quite soft, and easily disintegrated ; the former is tough. This tough curd cannot be digested by the majority of infants, and the lumps pass through the alimentary canal almost unaltered, except that they have fermented and are giving off ptomaines and gases. Such decomposing lumps will set up enteritis, with diarrhœa and convulsions.

Cow's milk, as usually obtained, is acid and contains already many bacilli ; human milk is sterile and alkaline.

Cow's milk, therefore, to be made at all fit for infants' food must be subjected to some mode of preparation.

It may be used diluted with water holding various substances in solution ; diluted, with added cream ; deprived of most of its casein (whey) ; sterilised, diluted or not ; peptonised and diluted ; condensed ; in manufactured 'foods.'

Diluted with Water holding various substances in solution.—This is the commonest way in which infants' food is prepared. Water is added in the proportion of three parts to two of milk, and then sugar, one moderate-sized lump to 2 oz. or so of the mixture. It is better to be more exact, and add in the above proportion water containing 5 per cent. of milk-sugar. Sufficient lime-water to make the mixture alkaline is advisable. After the first month or so milk and water may be used in equal quantities.

Instead of water, barley-water, or a solution of maltose or dextrin, may be used. This is believed to render the curd less tough ; and whether it does this or not, it has been proved by experience to be more easily digested.

Diluted, with added cream ('Humanised milk' of the dairies[1]).—Cream is added to make up the loss of fat in the milk after dilution. The cream when supplied by the dairies is not by any means free from micro-organisms, and unless it is obtained from fresh milk specially treated, it may be dangerous from this cause. The cream should be produced by a 'separator,' which does its work by centrifugal force in a few minutes without any need for the milk to stand. All the cream so obtained may be mixed with half the separated milk, and the mixture diluted and treated as before.

Deprived of its Casein (whey).—This must be quite fresh, and may be used with or without cream. If cream is added it should be in the proportion of 1–6 or 8.

Sterilised.—Sterilisation removes the various micro-organisms which multiply rapidly in milk that is kept, and produce ptomaines and turn the milk sour. Milk may contain also the organisms of tubercle, or other specific diseases, including the exanthems.

It is found that, if the milk is fresh to start with, a temperature of 160° F. is enough for all purposes, and does not alter the flavour or coagulate the lactalbumin.[2]

After milk has been kept at a temperature of 212° F. for over an hour, the casein produced on coagulation is found to clot less firmly, and to more nearly resemble that of human milk than if the milk had not been so treated. Budin and Chavane use this milk undiluted, and have found it extremely suitable and successful. The milk after this process is, however, found to have lost some of its emulsion, and large drops of butter which are not easily digested are separated out.

Peptonised.—After cow's milk has been peptonised the curd is found to be softer. It will often agree with children whom ordinary diluted milk does not suit. Peptonisation must not be carried to the full degree, for the milk is then rendered bitter. Ashby and Wright recommend that the cream mixture described above be used, and that the process of peptonisation be carried out in the sterilising apparatus. They advise that 'a reliable peptonising powder containing pancreatin and soda be added to the

[1] This is usually sterilised.

[2] Hawksley, of 357 Oxford Street, supplies a steriliser for this purpose.

mixture when nicely warm (110° F.), and the temperature raised during the next ten minutes or quarter of an hour to 160° F., when the process is complete. Or the temperature may be raised to the boiling point.'

As Condensed Milk.—This is often very useful for a short period, and may agree with the child when diluted fresh milk will not. It should be diluted to about 1 in 12 for infants. Care must be taken to get a reliable brand; the 'Milkmaid' brand has been found so; it contains about 12 per cent. of fat, so that it is desirable to add cream to bring up the 1 per cent., when the condensed milk has been diluted twelve times, to the normal 4 per cent.

In Manufactured Foods.—These consist of desiccated milk, with milk-sugar and dextrin. They are sterile, and are convenient where reliable milk cannot be obtained. They may be tried with advantage when the child is unable to digest the proteids in other preparations, and where the difficulties of peptonising the milk as advised cannot be overcome. The directions for use supplied with the food must be carefully observed.

From the above methods of preparing the child's food, one has to be selected; and if it is wished to give the child the best possible chance on an artificial diet, it will be wisest to choose the method of sterilisation and peptonisation described. Many children, however, thrive on the milk simply diluted, or with added cream. It is not advisable to keep the child on condensed milk for more than a few weeks, as it is, in the opinion of many, a cause of rickets and infantile scurvy.

The food should be taken by a healthy child from a bottle. The only kind of baby's bottle that is admissible is one that can be perfectly cleaned without difficulty. Thus all indiarubber and glass tubes, and corks, must be abolished, and the apparatus reduced to a smooth bottle, with, as recommended by the above authors, no raised or indented letters on the glass, with a large teat of indiarubber fitting over its mouth. This may with advantage be large enough to be turned inside out and so completely cleaned, and it may be kept in a solution of boracic or sulphurous acid when not in use.

The bottle should be given to the child about every two hours during the day, and should contain about two ounces of whatever mixture is employed, at about the temperature of the body. The child should be taught to sleep for five or six hours during the night. It should never be allowed to have the bottle in its cot while it is unwatched; and it is a good rule never to give the child the bottle in the cot at all, but always to take the baby up during its meals. The greatest care must be given to the cleansing of the child's mouth after its meals; this is done with a soft cloth or handkerchief, and a little glycerine of borax and water.

PATHOLOGY

THE pathological part of this work is arranged in the same order as that dealing with physiology, and the Pathology of Pregnancy, of Labour, of Lying-in, and of the New-born Child are in turn considered. In the Pathology of Labour, a section on Obstetric Operations is included. To this section a reference may be made by the student in the case of his meeting with allusions to operative procedures in chapters earlier than those dealing with this subject.

The organs and the tissues which are affected by disease, or are abnormal, are, in each of the above divisions, arranged as nearly as possible in the same manner and sequence as in the physiological part.

CHAPTER XXXV

PATHOLOGY OF PREGNANCY

IN this division the abnormalities and diseases of the pregnant woman and the ovum are considered in the order of description adhered to in the account of Normal Pregnancy, as follows :—

Ovum and decidua.

The diseases and abnormalities of the decidua are grouped for convenience with those of the envelopes of fœtal origin (see Chapters I. and II.)

Maternal Organism :—

1. Affections, directly connected with pregnancy, of (*a*) the generative, and (*b*) other organs.

2. Affections of independent origin, which only accidentally complicate pregnancy, of (*a*) generative, and (*b*) other organs.

Abortion and Premature Labour. Ectopic Gestation.

Hæmorrhages during Pregnancy.

AFFECTIONS OF OVUM AND DECIDUA

Decidua.—The affections of the decidua not essentially involving the placenta are alone treated of under this heading.

They comprise inflammation and its results, hæmorrhages into and under the decidua, anomalies in development.

Inflammation (*Endometritis decidualis*)

This may be acute or chronic, but as during pregnancy the former probably only occurs in connection with acute fevers or traumatism, it comes under the description of acute fevers or abortion.

Chronic decidual endometritis is usually described as being of two kinds, one of which results in thickening, or fibrosis, of the endometrium affected (E. d. tuberosa s. polyposa), and one in which the only sign or symptom is a watery discharge which occurs during the later months of pregnancy, and in which no special pathological changes have been described.

Endometritis decidualis tuberosa s. polyposa consists in a chronic inflammatory change in the decidua, which may be general or local, and results in abnormal adhesions of the affected tissue to the uterine wall, and in thickening of a more or less irregular character.

Causation.—The causes, as far as is known, are :—Endometritis existing before conception ; irritation due to a diseased, or a retained dead, ovum ;

injuries from, for instance, blows on the abdomen, or conceivably from the passage of instruments. Syphilis is not by any means established as a cause, but most affections of the membranes of the ovum are, for want of a better explanation, accredited to syphilis.

Morbid Anatomy.—The decidua is found to be changed from its friable easily detached condition, to one of tougher consistence. It has undergone a cirrhosis, the interglandular cellular tissue becoming fibrous, and the glands atrophied. In some cases, as shown by the names given to this affection, the free surface is elevated into tuberosities, or even polypoid excrescences. Often there are extravasations of blood into, or under, the altered decidua, and the condition merges into that of a carneous mole (p. 248). The development of the ampullary layer (see p. 7) is interfered with, and the membranes are in consequence more adherent than normal to the uterine wall.

Symptoms and Signs.—There are no definite symptoms, unless the disease ends in abortion. This sometimes occurs in severe cases, where much extravasation ensues, even when the decidua vera alone is affected. When the serotina also is diseased, the danger to the ovum is much increased.

If the embryo dies from failure of nutrition, the ovum may be expelled, or retained for some time as a blighted ovum (p. 250).

In certain cases where the hæmorrhage into the decidua is considerable, the result is a 'mole' (see p. 248).

Treatment.—No curative treatment can be adopted, for the disease cannot be diagnosed ; but in the case of abortion, threatening or actually occurring, this affection may be borne in mind as being likely to produce abnormal adhesions of the membranes.

Endometritis Decidualis Catarrhalis (Hydrorrhœa gravidarum).—This condition is recognisable clinically. It has been defined already.

Its morbid anatomy is not known. The fluid, however, comes from the space between the decidua vera and decidua reflexa, and this space, or some part of it, must be persistent very late when the discharge occurs, as it usually does, during the latter months of pregnancy.

The fluid is thin, resembling liquor amnii, and occasionally contains blood.

Symptoms and Progress.—If there is a free outlet for the fluid, it runs away as it is produced, and possibly is not noticed unless the quantity is considerable. More commonly, however, it collects and is discharged at intervals in gushes. In such cases the uterus has been noticed after the gush of fluid to become smaller, and contractions have been felt by the woman. Such a sudden change in the shape and size of the uterus sometimes causes labour to begin ; and, in fact, labour in cases of this affection is usually premature.

Hydrorrhœa occurs most commonly in the latter months of pregnancy, but may begin in the third or fourth month.

Diagnosis.—This disorder has to be distinguished from rupture of the membranes (amnion and chorion) and discharge of liquor amnii, and from rupture of the chorion alone and discharge of the amnio-chorionic fluid occasionally present (p. 114).

The fluid is as a rule shown to be not liquor amnii, first, by the pregnancy pursuing its ordinary course in other respects, and second, by the repetition of the discharge. The latter character also distinguishes hydrorrhœa from the discharge of amnio-chorionic fluid. In exceptional cases, however, labour does not come on immediately after the discharge of the liquor amnii. Matthews Duncan[1] describes such cases—one where forty-five days elapsed after the discharge of some of the waters ; and such instances are within the experience of most. He mentions also other discharges of fluid which may occur during pregnancy—namely, discharge of urine from the bladder during coughing, and discharge of the liquor amnii of one ovum in a case of plural pregnancy. There is no evidence that the fluid, if collected, could be distinguished from liquor amnii, or from amnio-chorionic fluid ; but the presence of urea (p. 19) would certainly be strongly suggestive of liquor amnii.

Treatment.—Rest in bed, with sedatives, is the only treatment. The physician should always be prepared for a summons to attend the labour, whether he is certain of his diagnosis or not.

Hæmorrhage

Formation of a Blood-Mole or Carneous Mole ('False conception').—Hæmorrhage into the substance of the decidua or beneath the chorion may be due to, or combined with, chronic endometritis, as already mentioned.

It is also caused by violence or injury to the uterus, such as blows on the abdomen ; by incarceration of the retroverted gravid uterus ; by the uterine contractions in the actual detachment of the ovum during abortion from any cause ; and may possibly occur in cases of severe obstructive heart disease.

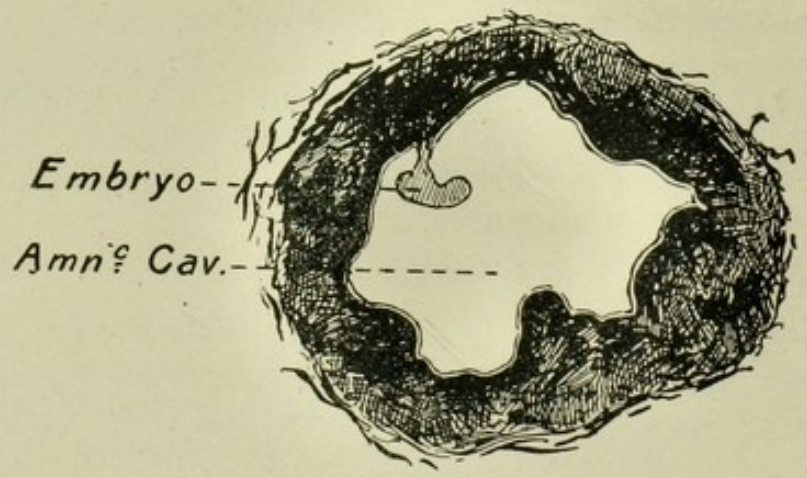

Fig. 237.—Diagrammatic section of a carneous mole.

Morbid Anatomy.—The bleeding may take place into the decidua vera or the serotina. The membrane is destroyed and broken up to a greater or less extent, and the blood frequently forces its way into the space between vera and reflexa, or it may reach the amnio-chorionic space, or even the amnionic cavity.

The chorionic villi, whether the hæmorrhage occurs, as it usually does, before these structures become limited to the placental area, or after the

[1] *Obst. Trans.* vol. xiv. p. 216, 'Missed Miscarriage or Labour.'

placenta is formed, are rendered useless by the compressing action of the extravasated blood, which soon clots firmly. If the ovum is still retained in the uterus, the villi occasionally become irregularly swollen (fig. 239).

Either by failure in its nutrition owing to this destruction of the decidua, or by the direct pressure of the extravasated blood on the ovum, the embryo dies. Frequently the direct pressure ruptures the ovum, and the liquor amnii and the embryo escape; but if this does not happen the embryo usually disintegrates, and is more or less completely lost.

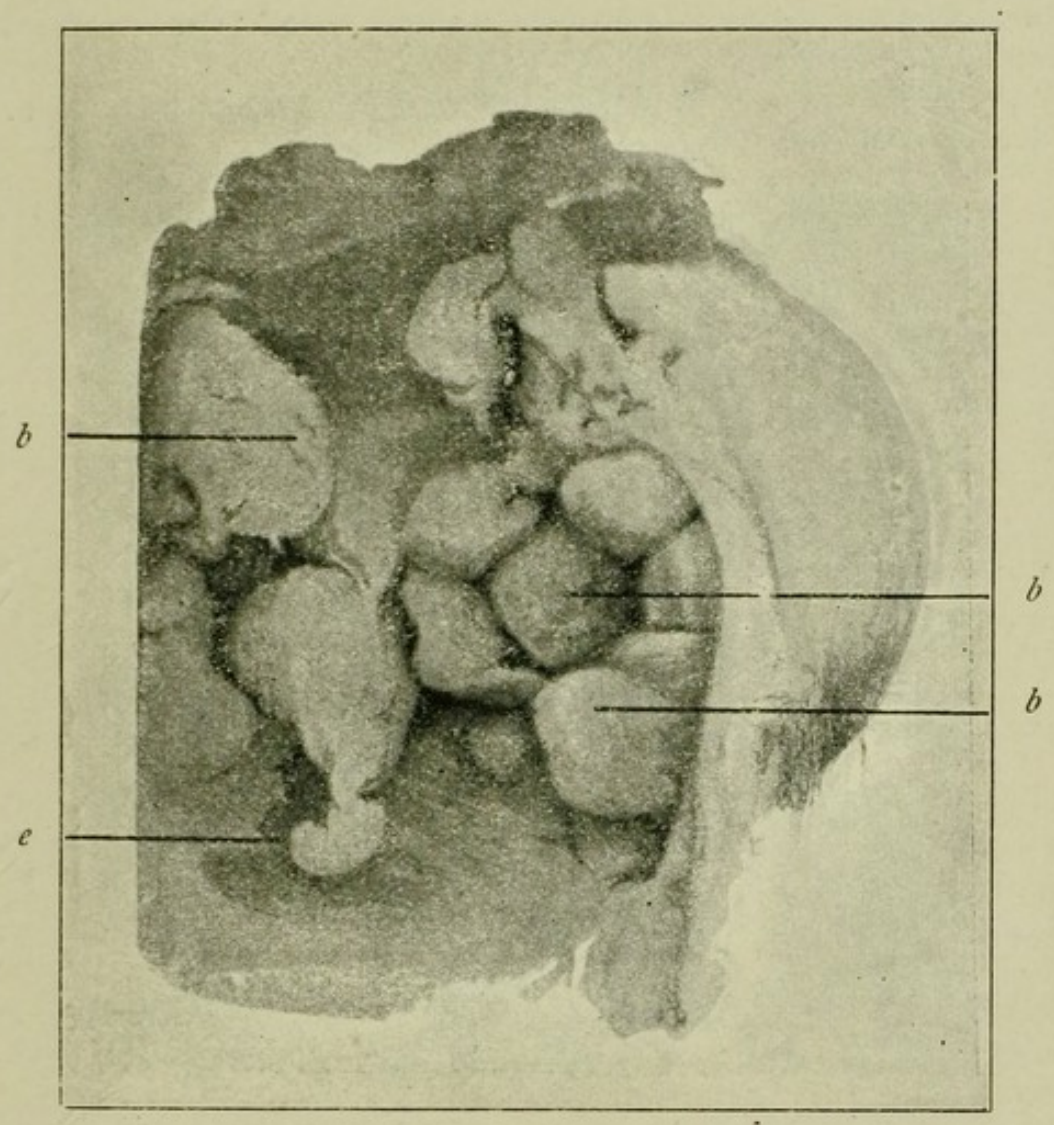

Fig. 238.—A carneous mole, opened. The external surface is to the right; the bosses, *b*, *b*, are seen on the inner surface; *e*, embryo, with short, thick untwisted cord. (The specimen was photographed in a bottle, and this accounts for the appearance of the left-hand edge.)

The result of these changes is the formation of a blood-mole. This consists of a thick-walled cyst, lined with amnion, which is bulged up into irregular bosses (fig. 238) by the blood. The blood is clotted among the villi of the chorion and in the tissue of the decidua, and to a great extent decolourised. The blood-infiltrated tissues form the cyst-wall (fig. 237), which often attains the thickness of an inch, and may enclose a cavity of about the same measurement in diameter.

A mole may be expelled soon after the death of the embryo, or may be

retained, probably owing to the abnormal adhesion of the decidua to the uterine wall, for some weeks, or even months (Missed Abortion). (See also Intra-Uterine Diseases of Fœtus, p. 269.)

Expulsion usually occurs before the fifth or sixth month, but is sometimes found to be delayed indefinitely. In the latter case the blood undergoes further changes, and the mass shrinks, and may even become calcified. The irregularities of the amniotic surface above mentioned may become converted into cysts, which project into the cavity of the amnion, and contain a sero-sanguineous fluid.

If organisms of decomposition obtain entrance to the uterus, the ovum will putrefy and break up.

In the examination of a doubtful mass of the kind described, sure evidence is found of its nature in the presence of villi.

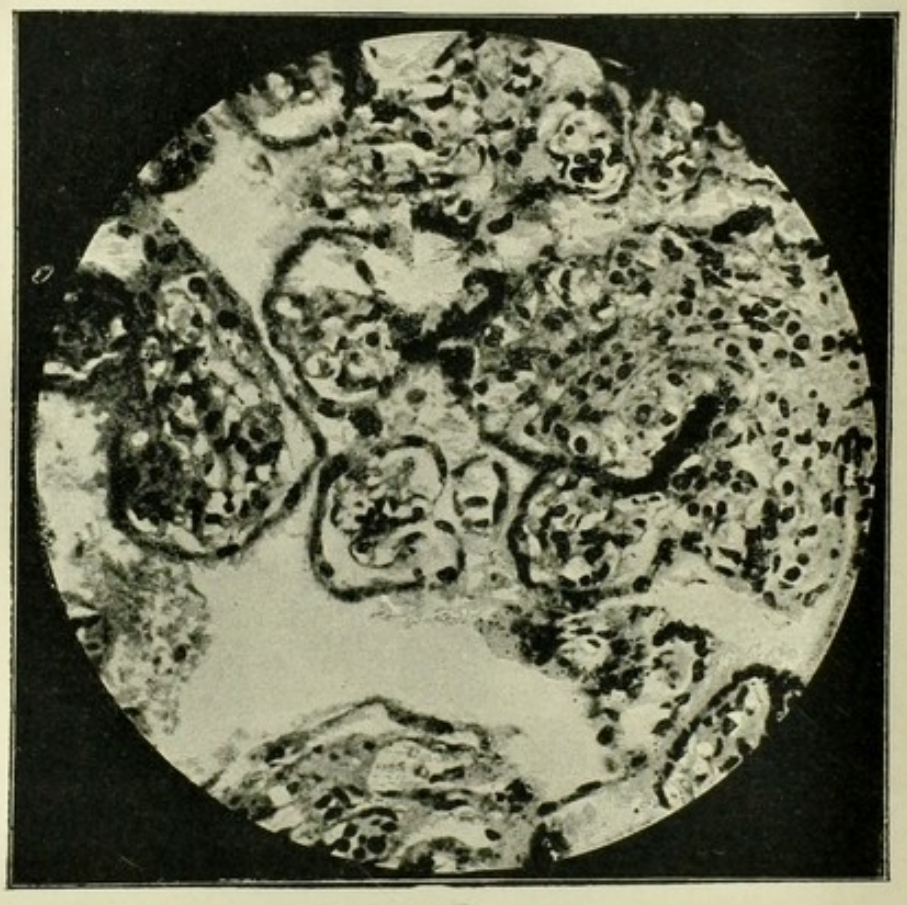

Fig. 239.—Villi cut in various planes. The spaces between them are filled with blood, more or less changed. This specimen shows some fatty degeneration (osmic acid). (Eden.)

Chorionic Villi.—These will be embedded in the mass of coagulated blood in almost all cases, and if present they may be demonstrated by teasing a small piece of the mass out under a low power, or by making sections of it (figs. 239, 264 and 265).

If the mole be passed entire, it forms a mass often ot the size and shape of an orange, and it will be seen on section to enclose a more or less well-marked cavity, lined with the smooth or slightly altered amnion (fig. 238). If the disease has arisen after the beginning of the third month, there may be traces of an umbilical cord attached to the inner surface. It is not very usual to find any trace of an embryo.

If the mass is passed in pieces, one side of a piece may be found smooth, the other rough ; and villi should be looked for in the substance of the mass.

A mole passed entire has to be distinguished from a *myoma* which has been expelled from the uterine cavity. The presence of villi in the mole will readily enable the physician to distinguish between the two. It must be borne in mind that either may be calcified, though calcification of a mole is very rare.

The presence of villi and the thickness of the wall will also prevent a mole being confounded with the membrane passed in cases of membranous dysmenorrhœa, and with the decidua in the case of ectopic gestation.

Symptoms.—The indications of the formation of a carneous mole are not well marked, and in cases where the death of the ovum has occurred in this way, the diagnosis of the existence of pregnancy is not always clear. What may be expected is this : the woman has considered herself pregnant, and has had the rational signs—vomiting and suppression of menstruation—of early pregnancy. Then, after a month or so, she finds the vomiting cease ; her breasts, which may have been enlarging, become flaccid, and her abdomen, if the pregnancy has reached the stage at which enlargement of the abdomen can be appreciated, does not increase. The latter sign will usually be wanting, since carneous moles are formed for the most part before the third month, and abdominal enlargement due to pregnancy is not observed before the fourth.

The uterus does not grow, but frequently becomes smaller and nearly always harder. This can be made out by bimanual examination. Menstruation does not take place, and there is often a brownish discharge due to irritation of the uterus by the mole and tingeing of the discharge by some of the colouring-matter of the effused blood.

The condition of retained dead ovum has been called 'missed abortion,' a term of which the application is obvious.

A woman so affected may suffer no further unpleasant symptoms than those described until the mass is expelled. Sometimes she shows the effect of septic absorption, the ovum having begun to decompose, and she may have a foul discharge ; or attacks of hæmorrhage due to partial separation of the mass from the uterus.

Clinical Diagnosis.—The conditions most likely to be confused on account of their physical signs with a carneous mole are (1) a normal pregnancy where conception has occurred after one, two, or more months of amenorrhœa due to some other cause. The uterus will here be smaller than the date of the last menstruation would lead one to expect ; (2) a fibroid tumour of the sub-mucous variety in process of spontaneous expulsion (in these cases, however, there is usually a history of previous menorrhagia) ; (3) cancer of the body of the uterus. This is extremely unlikely to be confused with carneous mole, as it always occurs, at the earliest, quite at the end of the child-bearing period. It would resemble it by increasing the size of the uterus, and giving rise to a foul discharge. If pregnancy is observed to develop, and the uterus to grow normally, the matter is easily settled. In any of these cases, dilatation and exploration of the uterus are indicated when the woman is suffering from uterine hæmorrhages or discharges, especially if the discharge is foul, and there are septic symptoms.

Treatment.—The uterus should be emptied as soon as the existence of a missed abortion is diagnosed; for although patients often suffer no harm from retention of a dead ovum, they are always liable to do so, and in any case the endometrium must be the worse for its presence. A laminaria tent should be inserted into the cervix, dilatation completed if necessary with some form of rapid dilator such as Hegar's, and the uterus emptied in the method described under 'Abortion.' It is most important that rigid antiseptic measures should be adopted in these cases, since any breach of surface caused during the evacuation may become infected by the possibly decomposing contents of the uterus.

If there is a foul discharge, showing that the uterine contents are decomposing, it is better at once to rapidly dilate with Hegar's dilators without first employing tents; and, after evacuation, to well wash out the uterus with a 1–2000 solution of corrosive sublimate, and leave an iodoform pessary [1] in the uterine cavity.

Imperfect Development of the Decidua Vera and Reflexa

These are rare conditions; in such cases the reflexa is more commonly absent to a greater or less extent. The result is abortion; the ovum is attached to the uterus by only the serotina, which is gradually drawn out into a kind of stalk, and finally severed by the uterine contractions.

CHAPTER XXXVI

AFFECTIONS OF THE CHORION

THESE are two in number: (1) myxomatous degeneration of the villi, resulting usually in the formation of a vesicular or hydatidiform mole; and (2) diffuse myxoma, which is only a pathological curiosity.

Vesicular Mole.—The disease may be limited to that part which forms the fœtal placenta, or may affect the whole extent of the chorion, according to the date of pregnancy at which the disease becomes established. This will be understood when it is said that the villi alone are attacked.

Definition.—The process consists in a myxomatous degeneration at intervals in the length of the several villi, resulting in the formation of cysts by liquefaction of the degeneration products.

Causation.—Since this is a disease of the ovum, pathological conditions in the mother can have only an indirect influence in its production. It has been supposed to be due to uterine diseases of various kinds—endometritis, fibroids, and others—acting immediately on the chorion. Tending to show that this is not true, however, cases of twin pregnancy have occurred in which one ovum was perfectly healthy, and the other partially or wholly

[1] Containing about 15 gr. of iodoform with glycerine, gum, and starch.

affected by the degeneration. In addition to this, it has only very rarely been found to recur in the same woman, and no uterine abnormality has been seen constantly associated with it. The death of the fœtus is not the cause, since living fœtuses are sometimes observed to have partially degenerated placentæ. The mother's health, however, must have some influence on that of the ovum she produces, and whose connection with her is so intimate ; and it has been found that vesicular moles occur oftener in pregnancies when the mother has reached middle age. A certain number of cases have been recorded, too (1) where this disease accompanied dropsy in the fœtus and mother ; (2) (though the instances are extremely rare, as already said) where a woman has borne several vesicular moles in succession.

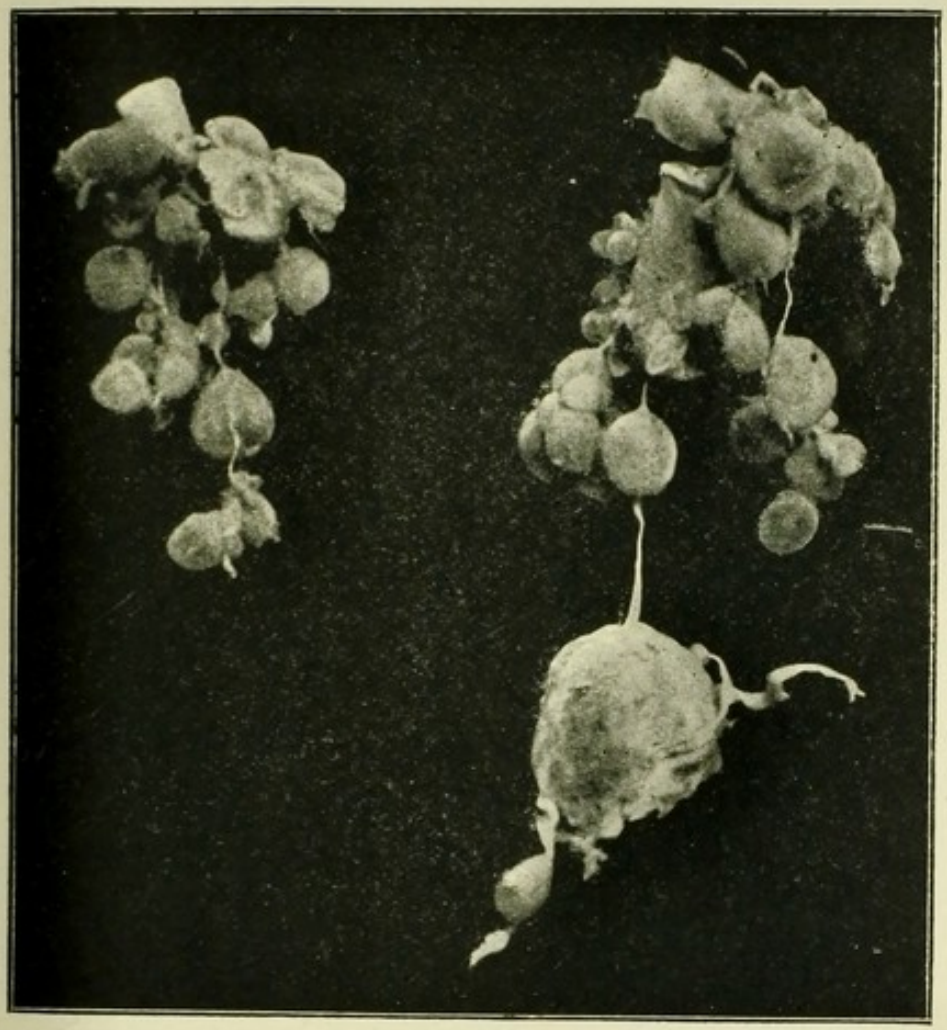

Fig. 240.—Groups of villi from a vesicular mole. Natural size.

Morbid Anatomy.—The myxomatous degeneration begins most commonly during the first two months, a period at which the whole chorion is clothed with villi, and the morbid change has the opportunity of becoming general. It occasionally begins later, after all the villi but those forming the fœtal placenta have atrophied ; and in this case it may affect either the whole placenta, or only isolated cotyledons.

The affected villi are swollen at intervals in their length owing to the overgrowth and breaking down of their cells and inter-cellular substance. At each of the spots where the degeneration has occurred, the cells have

liquefied and formed a vesicle. The result is a moniliform appearance of each branch of villus affected. The structure of such a vesicle is as follows: the fluid, of a consistence varying between that of water and that of glycerine, and containing mucin and albumin, is enclosed by a layer of connective tissue cells, degenerated but not liquefied. More externally the cells merge into the connective tissue cells forming the ground substance of the villus; and enclosing these again is the epithelial sheath. The vessels of the villus are atrophied.

The effect of this change is to produce a mass of vesicles (fig. 240), which either involves the whole ovum, and may reach to the size of the fœtal head, or affects only the placenta, wholly or in part. The vesicles vary in size from that of a pin's head to that of a filbert, and the fluid in the larger-sized vesicles is thinner than that in the smaller. Their relative position in regard to one another will be understood from the description just given of their formation and from the diagram (fig. 241), and it will be seen that they are not arranged on separate stalks like the berries in a bunch of grapes, but resemble rather the beads on a necklace. The mole, or so much of the placenta as is degenerated, is attached to the decidua; which is much thickened, and may become abnormally adherent to the uterine wall, and prevent complete separation of the ovum The degenerated villi occasionally extend deeper than this, and perforate the muscular wall of the uterus. (This is not infrequently done to a very slight extent by the normal villi (p. 14).) A few cases of the kind have been recorded both where the placenta only was affected, and also with general disease of the chorion; and death has occurred from hæmorrhage or peritonitis, owing to the uterine sinuses becoming freely invaded by the growth, and to rupture of the thus weakened uterine wall at some place where the muscle has been eroded.

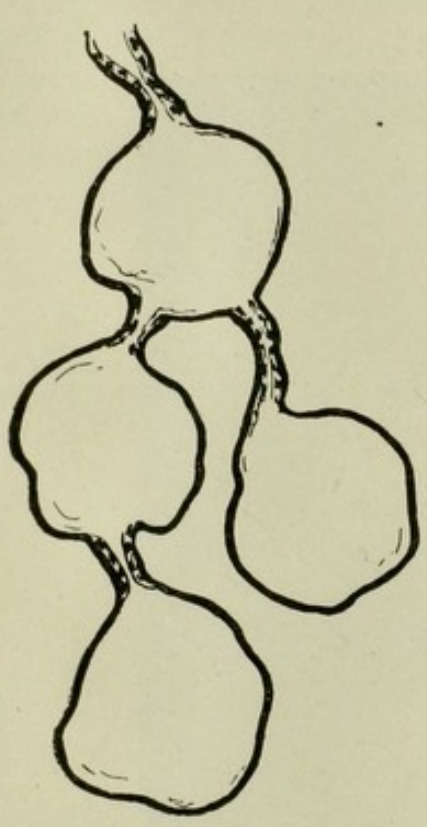

Fig. 241.—Diagram of affected villus.

A search in a complete mole for the embryo may be unsuccessful, or very rarely an atrophied one may be found. The amniotic cavity is often very small in such cases, and may be difficult to identify. In cases where the placental villi only are affected, the fœtus may be normal or diseased, or undeveloped in varying degrees, according to the amount of placenta involved in degeneration; the amniotic cavity will be evident; and there may be a fair quantity, and sometimes even an excess, of liquor amnii. Sometimes isolated vesicles may be found in the non-placental part of the chorion.

Symptoms and Course.—Owing to the swelling of the degenerated villi, the ovum becomes rapidly larger, out of all proportion to normal growth.

The result of this in cases of complete mole is as follows: during the first month or two there is probably nothing abnormal about the pregnancy. Very likely nothing is noticed until the rapidly increasing size of the ovum causes

the uterus to resent the too hurried stretching and to contract, partially detaching its contents, and causing some pain and hæmorrhage. In many cases the usual sympathetic affections of normal pregnancy are intensified, notably 'morning sickness.' The disproportion between the size of the uterus and the calculated duration of pregnancy may, about the third month, be sufficiently striking to attract attention. The absence of fœtal signs is mentioned under 'Diagnosis.' The hæmorrhage becomes more profuse as more ovum is separated, and rarely some of the vesicles are said to be detached and appear whole in the discharge, which is composed of blood and the fluid from the ruptured vesicles.

Expulsion of the uterine contents usually ensues. The date at which this occurs varies, depending on the irritability of the uterus, the rapid growth of the ovum, and the extent of chorion involved. The commonest time, if the whole chorion is degenerated, is perhaps about the fourth month, and by this time the fundus uteri may have reached the navel or above it. Expulsion may occur without any very great hæmorrhage if unassisted ; but, on the other hand, the bleeding may possibly be dangerous, if not fatal, in the absence of help. The ovum is sometimes expelled pretty nearly entire, but usually comes away in pieces, which are detached either by uterine contractions, or by the fingers of the medical man. Some of the growth may be left behind, being adherent, and then may give rise to septic trouble.

If there be another and a healthy ovum in the uterus, it may be retained, or may be expelled with the mole. In addition to the danger from hæmorrhage, and the remote possibility of rupture of the uterus, the patient runs the risk of septicæmic infection during the manipulation required to clear out the uterus ; and also the loss of blood renders the patient less able to resist septic infection.[1] Otherwise the prognosis is fairly good.

Diagnosis.—This is, as a rule, not made till the mass begins to be expelled. In the cases where the disease is suspected, and the appearance of vesicles in the discharge is awaited to confirm the diagnosis, it will usually remain unconfirmed. The points most strongly suggesting a vesicular mole are the disproportionate enlargement of the uterus in a case of pregnancy, and the absence of any sign of the presence of the fœtus. The fœtal heart cannot be heard, nor can the fœtal parts be felt, nor ballottement obtained, although the uterus may be of the size of a 5½ months pregnancy. The addition of a blood-stained discharge to these physical signs renders the diagnosis more certain, and the discovery of vesicles in the discharge would make it completely so.

It will be remembered, however, in examining such a case that it is possible that a living fœtus may coexist with a mole, and therefore that fœtal outlines and sounds do not absolutely exclude this condition.

Treatment.—If a pregnant woman is bleeding dangerously, the uterus must be emptied in any case as soon as possible, whether a diagnosis be made or not. If the diagnosis of hydatid mole is certain (from the discovery of vesicles) the cervix if closed must be dilated for this purpose, unless fœtal parts are discovered in utero by external examination. In such a case, if the bleeding

[1] Menge mentions (*Z. f. G. u. G.* vol. xxx. pt. 2, 1894) malignant degeneration as sometimes occurring in portions of the endometrium some months after the expulsion of a hydatid mole. (See p. 578.)

be only slight, it may be as well to wait awhile and see if the uterus will expel the mole without the healthy ovum. Or, supposing the degeneration has occurred in a single ovum and is only partial, the pregnancy may go on to term if allowed.

As long as the diagnosis is only probable, the amount of bleeding is the best guide. If this is not dangerous the case should be treated like a threatened abortion (p. 310.), and on the same principles. If the bleeding is free the uterus must be emptied. The cervix will, in nearly all such cases, be found open, or very easily dilatable ; but if it will not admit two or three fingers, it must be dilated with hydrostatic bags, which will in the meantime act as efficient plugs.

In cases where vesicles have been expelled and evacuation determined on, with a still closed cervix, a laminaria tent must be introduced, and then Hegar's dilators used to complete the dilatation if necessary.

Before the evacuation a dose of ergot (ext. ergot. liq. 3j–3ij) or mv–x of inj. ergot (B.P.) should be administered ; the bladder and, if there is time, the rectum emptied ; and the patient anæsthetised. The uterus is then compressed by the left hand outside the abdomen, and masses which present at the os coaxed out by the fingers of the right hand passed through the cervix. All through the process of evacuation more should be done by expression than by traction.

When the uterus is nearly empty, and has contracted down, the fingers will be able to explore its cavity and bring away any still adherent pieces, if it is pressed firmly down by the left hand on to the internal fingers. Care must be taken to use no force with the fingers inside, for the occasional erosion of the muscle by the villi is to be remembered, and the consequent possibility of rupture in such cases by rough handling or by the use of the nails.

All these manipulations must be conducted under the most strict antiseptic rules, and a hot intra-uterine douche of sublimate (1 in 5,000) or carbolic acid (1 in 60) should be given when the operation is finished.

The patient will then be treated as a case of miscarriage, and be kept in bed for a week or more. Regular antiseptic vaginal douches are advisable in such cases—one douche a day of sublimate (1 in 5,000) being given.

Myxoma of the Chorion may occur in the layer of this membrane which lies next the amnion ; but a few cases only have been described.

The degeneration may be diffuse, as it was in the first case ever described ; or partial, forming isolated masses.

Its cause is as unknown as that of myxoma of the villi. It apparently has no effect on pregnancy. The chorion in the diffuse variety is thickened [1] and nodular. The histology is that of mucoid tissue. The isolated masses have the same minute structure.

[1] In Breslau and Eberth's case, the first described, to 5 mm. or 2 in. (Virchow's *Archiv.* vol. xxxix. p. 191, quoted in Spiegelberg; *Text-book of Midwifery*, New Sydenham Society.)

CHAPTER XXXVII

AFFECTIONS OF THE AMNION

EXCESS and scantiness in the quantity of the amniotic fluid are the only diseases to be described. Certain other incidental pathological conditions may be found at the same time in the ovum.

Although not a disease, the condition of dark-coloured liquor amnii not due to the presence of meconium as far as is known, may be mentioned here. It is occasionally observed, and has no symptoms or results.

Hydramnios. Hydrops Amnii.

Definition.—This is a condition in which the liquor amnii is in marked excess. Its results and symptoms are, as far as is known, all due to the mechanical action of the excessive bulk of fluid.

Causation.—It is not proved whether the mother or the fœtus is principally concerned in producing this disease ; but it is most probably a fœtal disorder, for it rarely shows itself before the last three or four months of pregnancy are reached ; and, whatever may be the possible sources of the liquor amnii in the earlier months, the fœtus is generally considered to secrete it at this period. Hydramnios, moreover, often occurs in healthy women ; and in cases of twin pregnancy only one amniotic sac as a rule is over-distended ; and in one case of extra-uterine pregnancy the sac contained seven litres of liquor amnii. (Teufel.)

At the same time the fact that malformed fœtuses are common in this condition cannot be considered a reason for assigning its production to the child, since, owing to the intra-uterine tension, arrest of growth in delicate parts might easily be produced.

Diabetes in the mother has been found very frequently to concur with hydramnios ; and in one case certainly, and in another probably, the liquor amnii has contained sugar.[1]

This suggests a maternal influence, but it does not prove at all that the excess of fluid had its origin directly from the maternal vessels. In all probability, remembering how often the life of the child is sacrificed in a diabetic pregnancy,[2] the hydramnios in these cases is a symptom of fœtal disease, and the sugar may have diffused through the maternal placental vessels.

Diabetes insipidus appears to have no effect on the ovum.[3] There is no evidence that syphilis has anything to do with hydramnios.

It has been noticed that the child is nearly always a female, and that the ova of multiparæ are more liable to the disease than those of primigravidæ.

Morbid Anatomy.—The quantity of liquor amnii is increased beyond the normal one or two pints to five or six pints, or considerably more than even

[1] M. Duncan, *Obstet. Trans.* vol. xxiv. [2] *Ibid.* [3] *Ibid.* vol. xxix.

this. Its composition has not been found altered, except in the cases just mentioned; and no histological changes in the amniotic membrane have been noticed beyond fissuring of the epithelium, no doubt from stretching. (Ahlfeld.) The fœtus is in a large proportion of cases malformed or already dead when delivery takes place; and death is not always due to the usual prematurity of labour, for in a fair proportion of Duncan's cases the child died after reaching a viable age. It is sometimes dropsical, occasionally markedly so, and sometimes hydrocephalic; and the placenta under these circumstances has been large and flabby.

Symptoms and Course.—There is nothing, even in a subsequently well-marked case, to call attention in the earlier months to this affection. It may begin to be noticed by the fifth month. Thence onwards the uterus rapidly increases in size and tension. Its shape becomes more rounded than normal. Owing to the increased size and weight it tends to fall forwards; and, by resting on the anterior abdominal wall, to cause separation of the recti, and Pendulous Belly. From the same cause the circulation in the pelvis is more obstructed than usual in pregnancy, and there is abnormal œdema and congestion of the lower pelvic viscera. When the uterus is large enough, especially if the abdominal muscles are strong, the diaphragm is prevented from descending and some dyspnœa results; the stomach also is much limited in capacity, and vomiting is occasionally rendered severe and protracted. Albuminuria has been found in some cases of great distension.

When these mechanical disturbances become very severe, the uterus usually empties itself; and labour in hydramnios is nearly always premature.

Besides this result as regards the ovum, it has been mentioned that the fœtus is rarely healthy and is sometimes malformed. In consequence of the spacious uterine cavity the movements of the child are not restrained, so that it may assume any lie; and thus malpresentations are common.

A further consequence occurs during labour. The over-distended uterus is sluggish in its action. It becomes stronger when the liquor amnii has been expelled, but inertia is common at all stages, the worst results occurring post-partum, when hæmorrhage is particularly to be feared and guarded against. Rupture of the uterus has happened.[1]

Involution is said to be tardy, and is so, no doubt, on account of the previous distension of the uterus. It is almost a rule to find the uterus large during the puerperium after large children or twins have been born.

Diagnosis.—Mistakes have arisen in many cases of this disease, owing to the abnormal size, shape and consistence of the uterus; and they have often been confirmed by the impossibility of making out any fœtal parts, or hearing the fœtal heart. Careful examination will nearly always lead to a correct diagnosis, and the fœtal heart will be heard or limbs will be felt if frequent examinations are made. The confusion in some cases arises from the similarity of all the physical signs to those of a thinnish-walled ovarian cyst. The above signs if they can be obtained, the uterine bruit, and occasional uterine contractions, together with the breast changes, and the history (which is usually normal) of the earlier months of pregnancy, combined with the rapid growth, which may be verified by repeated examinations, will generally make the case evident.

[1] McClintock: *Clinical Memoirs.* 'Dropsy of Ovum.'

Greater difficulty may arise if early pregnancy exist with an ovarian cyst; but the recognition of uterine contractions in one part only of the abdominal mass will solve the difficulty (see p. 292). Carelessness is nearly always the cause of mistakes in these cases.

From twin pregnancy, with which it may also be confused, hydramnios is distinguished by the readiness with which in the case of twins the observer is able to come into relation with the children, stethoscopically or by palpation.

It will be remembered that hydramnios may be combined with twins.

Treatment.—During pregnancy, if the uterus is only moderately over-distended, it may be enough to support its weight by a belt, keeping the patient at rest as much as possible. In severe cases, where respiration and nutrition are dangerously interfered with, premature labour should be induced by puncturing the membranes. If the uterus can be emptied gradually, the danger of shock from sudden removal of abdominal pressure is avoided. To this end the puncture should be made between the pains if labour has begun; and as far as possible above the ring of the external os. This precaution may help to prevent the production during labour of malpresentations and prolapse of the cord.

During labour, the uterus must be carefully supervised and well supported from the abdominal side. Forceps, if found necessary, should be used with caution, and expression should always accompany traction.

A plain hot douche (115–120° F.) should be used immediately after the third stage is over, and full doses of ergot given.

Fig. 242.—Amnionic adhesions. (After Pinard and Varnier.) In this case a meningo-encephalocele was produced.

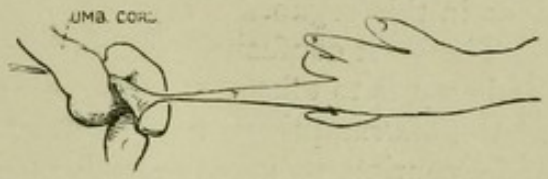

Fig. 243.—Amnionic adhesions compressing umbilical cord. (After Pinard and Varnier.)

The result as regards the mother is favourable if no concurrent affection, such as diabetes, exists. For the fœtus the prospect is not so bright.

Scantiness of Liquor Amnii. This condition is somewhat rare. It has been observed in connection with occlusion of the fœtal urinary tract, or absence of fœtal kidneys, but it sometimes occurs with a normal child. The degrees between a scantiness sufficient to be of importance and the natural quantity are of course infinite.

Symptoms.—In a few cases the fœtal parts are remarkably easy to map out by the abdomen, and this seeming closeness to the surface has been known to give rise to a diagnosis of ectopic ('abdominal') gestation. The uterus

is smaller than normal, and naturally less elastic. The fœtal movements are sometimes very painful to the mother.

Results.—The main interest of the condition lies in the possibility of the formation of adhesions between the amnionic surface and the fœtus, or between one amnionic surface and another. If such adhesions form early in pregnancy, and the amount of fluid later on increases, the adhesions become converted into bands. In this form they may compress parts of the child, a limb for instance, and cause its atrophy or prevent its development. Thus are produced some of the cases of intra-uterine 'amputations;' and other deformities (retroflexion of fœtus, &c.) may arise (see figs. 242 and 243).

During labour, since there is not enough liquor amnii to form a sufficient bag of waters, the first stage is much delayed.

No treatment is possible of the anomaly during pregnancy. During labour, the process of dilation may, if necessary, be assisted by hydrostatic bags.

CHAPTER XXXVIII

DISEASES OF THE PLACENTA AND CORD

THE diseases of the **Placenta** form a pathological group which has not as yet been clearly described; and though numerous observations have been made, and appearances detailed, there is not much agreement as to the exact nature and causation, and in consequence as to the classification, of morbid conditions in this organ.

The least confusing plan in describing such morbid changes as have been made out is to take the maternal and fœtal parts separately, and to state what abnormalities seem to have been established as occurring in each, endeavouring to explain such changes when possible by reference to the diseases affecting these parts before they are specialised and combined into placenta.

Maternal Placenta. Decidua Serotina.

Inflammation.—Inflammation of the decidual membranes has been already described, and as far as the accounts of observers go, the Decidua Serotina is at all events liable to similar alterations to those described under Endometritis d. tuberosa.

These changes have been in earlier times called 'cartilaginous,' 'sclerotic,' &c., diseases, and latterly 'interstitial placentitis.' The main fact about them is that they result in fibroid degeneration, and compression of the normal structures. Where the inflammatory process, if it is one, invades the deeper layers of the serotina the development of the ampullary layer is prevented, and placental adhesions occur. (See Retention of Placenta, p. 478, for results of this.)

By extension of the process towards the fœtal aspect of the placenta, the decidual processes become affected, and the villi among them suffer by com-

pression, and degenerate. This degeneration may be a simple atrophy, such as normally goes on in the villi over that part of the chorion which lies away from the placental area ; or it may be a fatty change. A fatty change in the villi is, however, believed to sometimes occur as a primary event (see fig. 239).

The degeneration of the latter kind is often accompanied by *extravasations of blood* from the vessels of the serotinal placenta. These hæmorrhages have been found of various sizes and in various stages of disintegration and organisation. Their effect is to render useless those villous tufts beneath and around which they form.

Fibrous masses, however, which in all probability represent old infarcts, and are mostly in the form of sub-amniotic plaques of condensed tissue, are found in almost every placenta, and have been mentioned in the description of the normal appearances of that organ.

Assuming this thrombotic origin to be the actual one, the frequency with which these masses are found shows how easily thrombosis takes place, and of how little pathological importance it is when limited in area. Extensive thrombosis in the placental sinuses has been described by Slavjansky.[1]

Similar masses are often found in a state of partial fatty degeneration, or softened into a fluid superficially resembling pus, but really consisting of disintegrating fibrin, and these last have been described as abscesses.

If large hæmorrhages happen during the early months, they will probably cause an abortion (see p. 303) ; if in the later months, they may be recognised as one or other form of accidental hæmorrhage. Considerable destruction of placental tissue by fibroid changes in the serotinal part may be followed by fœtal death.

The fibrous masses sometimes form the floor of *cysts* which may contain blood in a more or less recently clotted condition, or serum turbid with fibrinous or fatty débris. These conditions are found in the placentæ of healthy children and mothers (see p. 27).

The amnion is usually adherent to fibrous masses, but separable from the cysts.

Cysts beneath the amnion are also said to be formed sometimes from the remains of the allantois.

Fœtal Placenta

Villi.—In addition to compression or starvation by contracting fibrous material in the serotina, and to isolation by surrounding thrombosis, the villi undergo independent pathological changes.

The degeneration known as Vesicular or Hydatidiform Mole has just been described (see p. 252).

A rare condition, named by Virchow Myxoma fibrosum placentæ,[2] is also an affection of the chorionic villi. It consists in a fibroid degeneration occurring in single villi and their branches, and producing in each separate villus a thickened stem, with lumpy projections representing the larger branches, in which a few healthy terminal villi may be found. The vessels are occluded. The latter are said to be the site of origin of the disease.

[1] *A. fur Gyn.* 1893 ; Bd. v. p. 360.

[2] *Onkologie*, i. p. 415. Hildebrandt, in *Monats. f. Geb.* xxxi. Sinclair, *Journal of Gynæcolog. Soc.* Boston, 1871, p. 338. (Ref. from Spiegelberg.)

Sclerosis of the placenta has been described.[1] This is said to be due to hyperplasia and fatty and fibrous degeneration of the villi, which fill up the sinuses so completely that no maternal blood can circulate in them. It is questionable whether this is not one of the appearances resulting from decidual disease.

Syphilis.—Placentæ in cases of this disease have been studied, and but little agreement has been arrived at among the observers, chiefly owing to the fact that all the varieties of structure to be found in the placentæ of healthy women with healthy children are not fully known.

By careful observation appearances indistinguishable from those described as being characteristic of syphilis, maternal or fœtal, may be recognised in cases in which there is no reason to suspect disease of any kind.

Under these circumstances, this is not the place to record the changes which have been described.

Abnormalities of the Umbilical Cord.—*Knots* occasionally occur in the umbilical cord (in from 1 in 200 to 1 in 1,000 cases), but they are of no practical importance. They are produced by the passage of the fœtus through a loop. Not even when pulled moderately tight do they affect the circulation. It has been recorded, however, that during labour, especially with a short cord, a knot has been drawn so tight as to cause the death of the fœtus.

The cord is sometimes tightly coiled round the fœtal trunk or neck, or in some cases round a limb. The circulation in the limb will be interfered with, and intra-uterine 'amputation' (see p. 267) may possibly be a result. It is unlikely, however, that the cord ever cuts through a limb; since, if a sufficient degree of tension to do this were present, the circulation in the umbilical vessels would probably be arrested.

If the coiling takes place round the fœtal neck or trunk, especially if the cord be short to start with, there may be complete arrest of circulation in it from pressure, and in consequence, asphyxia. This state of things cannot, of course, be recognised under ordinary circumstances if it happens before the part round which the cord is coiled appears at the vulva. As the head is born it is not uncommon to find one or perhaps two turns round the neck.

Over-torsion of the Cord.—This is an exaggeration of the normal twisting of the cord, and has been known to be so excessive as to occlude the vessels. The twists are mostly near the umbilical end.

Irregularities and nodosities in the cord-tissue itself are extremely frequent, and have no pathological significance.

The vessels of the cord have been found diseased by various observers, as regards their internal and middle coats; and this disease in the case of the vein has been known to produce a sufficient thickening to diminish its lumen dangerously and (in one case described by Leopold) fatally. The lumps due to dilatations of the vessels which are frequently seen, seem to affect the arteries as a rule, rather than the veins.

[1] Neumann, in *Königsberger Med. Jahrbuch*, ii. 1860.

Too long cord and *too short cord.*—These are both merely developmental and not pathological conditions. As their effects are mainly displayed during labour, they have been placed for consideration in the section dealing with the abnormalities of the fœtus which interfere with normal labour (p. 478).

CHAPTER XXXIX

INTRA-UTERINE DISEASES AND DEATH OF FŒTUS

THE diseases and those malformations of the fœtus which have a bearing on pregnancy and labour will be most conveniently grouped according to the various systems of the body which they affect.

Nervous System.—*Hydrocephalus.*—This has already been mentioned as sometimes occurring in connection with hydramnios. It consists of a distension of the ventricles of the brain with serous fluid.

Anatomy.—The brain is sometimes expanded over the excess of fluid until it is not much thicker than writing-paper ; and the bones are prevented from covering in the vault, being separated by very wide intervals, and thinned out to some extent.

Hydrocephalus is sometimes combined with other abnormalities (*e.g.* spina bifida) of the neural canal.

Course of Pregnancy and Labour.—The fœtus is frequently in the podalic lie, owing to the head end being now the larger, and more comfortably occupying the fundus. One in five of all cases of hydrocephalus have been found to present by the breech (see fig. 206).

During labour the head may be completely arrested, though if the diameters are not increased much above those of the pelvis the head will pass, as it is plastic to a far greater extent that when the bones are normally ossified. It will be readily understood that a head of a given size passes more readily if it enters the pelvis by its base—that is, in a breech presentation, since the base is not appreciably widened by the disease, and acts as the thin end of a wedge.

Further details and treatment will be found in the section dealing with the Pathology of Labour.

If the child is born alive it does not usually long survive, and its further history does not belong to the present subject.

Anencephalus.—In this abnormality the encephalon is completely or almost completely absent. When born the child is found to have no vault to its skull, for the bones normally forming the vault are rudimentary. Those forming the base are much more convex than usual, and the cranial nerves, appearing to arise from a thin layer of tissue lying on the base, can be traced into their foramina, which are, however, much distorted in position. The

layer of tissue is probably a collapsed cyst, burst before or during labour, and representing the primitive cerebral vesicles which should have but have not developed into encephalon.

Occasionally the nervous tissue of the spinal cord below the medulla is wanting. The diagrams give a general idea of the head of such a fœtus, and there is a very strong family likeness in all specimens. The body of

Fig. 244.—Anencephalus.

Fig. 245.—Anencephalus.

the fœtus is, as a rule, well grown, and usually has very broad shoulders. The cephalic lie is the usual one, and on vaginal examination a very confusing presentation is found.

In some cases pregnancy seems to have been prolonged by a few weeks. After birth the child may live for an hour or more, and cases are recorded where life persisted for several days.

Encephalocele. Meningocele.—These conditions sometimes give rise to difficulty in labour, owing to the size of the tumour formed by the cyst.

Spina bifida seldom causes any difficulty in labour, as a very large-sized tumour is unusual. The tumour may be a myelocele or a meningocele. It is not uncommon to find malformations of the alimentary canal in the same fœtus as anomalies of the spinal cord ; and club-foot is a frequent accompaniment.

In breech presentations, spina bifida might be confusing. In one case which occurred to the author, the edges of the ununited vertebral arches could be felt before rupture of the membranes, resembling exactly the gums as felt in the mouth. The condition caused no confusion, as the head was recognised at the fundus.

Retroflexion of the Fœtus.—Here the spinal column, and in part the whole axis of the fœtus, is in a condition of extension instead of being flexed as normal. The deformity may be due to absence of the umbilical cord, so that the fœtus develops with its abdomen closely applied to the placenta, which forms its anterior abdominal wall. To grow in length the fœtus must follow the curve of the uterine wall. Its abdominal surface in consequence becomes convex, its dorsal surface concave. In these cases after the child is born, the placenta during labour having been torn from the abdomen, there is prolapse of all the unsupported viscera (Ectopia Viscerum.)

The child presents by the abdomen as a rule, and the liver and intestines are the parts which are first felt by the examining finger. Retroflexion is sometimes due to intra-abdominal tumours, not uncommonly to a distended bladder in cases of imperforate urethra ; or to amnionic bands (p. 259).

Alimentary System.—A lesser degree of the above-named prolapse of organs is found when the viscera are covered with a translucent membrane consisting of amnion and peritoneum only (exomphalos, umbilical hernia). This condition, which varies infinitely in degree, is probably due to a persistence of the early anatomy of the base of the cord, which for the first three months contains a loop of intestine. In the less severe cases only, an operation may cure the deformity.

Ascites.—Excess of fluid is found in the peritoneal cavity in connection with tumours, and enlargements due to obstructions of the ureters. Simple ascites, in the absence of any other obvious cause, has been ascribed to syphilis. It may be due in some cases to obstruction of the portal circulation by tumours, or cirrhosis of the liver ; and it is sometimes found in conjunction with hydramnios.

The Liver and Spleen have been found in a few cases to be sufficiently *enlarged* to obstruct labour.

Respiratory System.—Hydrothorax, usually found in connection with ascites, is a very rare condition, but has been described as a cause of delay in a few cases.

Urinary System.—Occlusion of the lower end of the urinary tract is the commonest cause of abdominal distension.

Very large tumours are sometimes produced in this way, and require evacuation before the abdomen can enter the pelvis. The occlusion is most commonly due to some maldevelopment of the hind-gut and its processes (atresia ani vesicalis, &c.), and may occur in the urethra. The ureters are, one or both, occasionally impervious, and hydronephrosis is caused.

Genital System.—Ovarian cysts and included fœtuses are on record as causes of delay in labour.

Osseous System.—Imperfect ossification of the skull is occasionally found in cases where there is good evidence of *syphilis.*

This is often asymmetrical, and occasionally part or the whole of one parietal bone is missing.

The same disease causes a characteristic abnormality of development at the line of union of the epiphysis and diaphysis.

Traces of this may be found after considerable maceration and even decomposition has occurred in a fœtus, and afford evidence of the cause of death. The condition is fully developed only in the later months. The changes found consist of an over-proliferation of the cells of the growing cartilage at the line above mentioned, with calcareous deposit in the inter-cellular tissue. This modified cartilage in a normal ossifying bone forms

a thin layer (about 1 millimetre), in the stage which immediately gives place to real bone. In syphilitic epiphysitis it forms a thick layer of several centimetres. As such partially ossified cartilage is brittle, separation of the epiphysis from the shaft may occur in active movement or during labour.[1] This separation is sub-periosteal, and the divided parts are kept more or less in continuity by their fibrous covering. It will be seen that histologically the process somewhat resembles what goes on in rickets. Inflammation (epiphysitis) may subsequently occur at the line of fracture, and then causes the small-cell proliferation and caseation usually found.

The commonest sites are, in order of frequency: lower end of femur; lower end of tibia; lower end of bones of forearm; upper end of tibia; femur, and fibula; upper end of humerus, of radius and ulna; lower end of humerus (Spiegelberg).

A more characteristic alteration in the flat bones, especially those of the cranial vault, than absence of ossification, is the production of osteophytes, which Cornil and Ranvier say are the 'most characteristic lesion of infantile syphilis.'[2]

Such osteophytes begin as osteoid tissue formed of 'completely or incompletely ossified trabeculæ enclosing spaces which contain more or less fibrous marrow. Ultimately the trabeculæ thicken and the spaces diminish; and finally the exostosis resembles in its characters a syphilitic exostosis in the adult.'[3]

Parrot[4] agrees with this. The outgrowths form plates which are to be found on the surface of the vault of the cranium for some months after birth.

Rickets.—Well-marked cases of intra-uterine rickets have been recorded with the histology and coarse changes which are found in the rickets of young children.

Naturally the characteristic bendings of bones found later, and due to the body weight and the action of certain muscles used by the child, but not by the fœtus, are absent. Muscular action in utero, however, can cause some of the changes found in extra-uterine rickets, such as pelvic flattening. Greenstick fracture also is possible from muscular action. Imperfect ossification of the cranial vault is found in some cases.

Sporadic Cretinism.—Many cases of this disease have been described as instances of fœtal rickets. Hilton Fagge[5] first showed the close relations existing between certain of the cases so described and endemic cretinism.

Without going into details, the condition is as follows: The general appearance of the fœtus is that of a dwarf, the head is large in proportion to the body, the shafts of the bones of the extremities are very short, but the limbs are as thick as usual. The fœtus is as a rule larger than normal. The skin is œdematous and semi-translucent. The thyroid gland is often, but not always, absent or diseased.

There is synostosis of the basilar suture of the skull, causing great shortening of the base.

[1] Cornil and Ranvier, *Manuel d'Histologie Pathologique*, vol. i. p. 444.
[2] *Loc. cit.* p. 445. [3] *Loc. cit.* p. 445. [4] *Bullet. Gener. Therap.* Ap. 1879.
[5] *Med. Chir. Trans.* vol. liv.; *Trans. Path. Soc.* vol. xxv.

The condition of the ossifying cartilage at the epiphysial junction is different from that found in rickets or syphilis. In the place of the arrangement of cartilage cells into rows as in normal ossification, there is an ingrowth of connective tissue from the periosteum. This ingrowth cuts off the cartilage of the medulla of the shaft, and is the cause of the failure in development.[1]

The *causation* of this disease is unknown.

Fractures.—Fractures may be caused by external violence applied to the abdomen during pregnancy.

Those of the limbs, if by the time of birth faulty union has not occurred, are quite satisfactorily treated. Those of the skull, if severe, are found to be usually fatal; but some cases of depressed, spoon-shaped fractures do very well without treatment, and subsequently fill up to a great extent, or completely.

The so-called congenital dislocation of the hip is, as is well known, not a dislocation, but a failure to develop of the acetabulæ.

Intra-uterine Amputations.—This is one result of insufficient liquor amnii (see p. 259). It is said that it may also be caused by constriction of the limb by a loop of cord which has accidentally strangulated it.

Amputation is believed to occur also in some cases of fracture when, owing to the child's movements, the fracture becomes compound, and the distal part separates owing to the inflammation at the point of perforation cutting off its blood supply. Rudimentary fingers sometimes are found on the face of the stumps formed in one or other of these methods, and consist of connective tissue, often bearing nails.

It is possible that some, if not many, of the cases of so-called 'amputation' are really the result of some central nervous deficiency.

Fig. 246.—Rudimentary development of left arm, forearm, and hand. The rudimentary hand is seen to bear fingers. (St. George's Hospital Museum.)

Glandular System.—*Goître.* The thyroid gland is occasionally enlarged. The main obstetric interest of this disease is its liability to cause face presentations. It is, however, so

[1] A. Bowlby, T. Barlow, Bland Sutton. *Path. Trans.* vol. xxxv. 'Sporadic Cretinism.'

extremely rare in this country that its effect on labour is infinitely small. The enlarged gland may cause compression of the trachea to a dangerous extent after the child is born.

The condition of the gland in cases of sporadic cretinism has been mentioned.

Connective Tissue.—General œdema is found in some dead fœtuses, sometimes at the same time as hydramnios. The placenta and cord in such cases are often œdematous too.

Syphilis of Fœtus.—Syphilis may be communicated to the fœtus while in utero by the father or by the mother directly. On the father's side it is conveyed by the semen at the time of impregnation. On the mother's a syphilitic ovum may be produced. The mother may be infected during pregnancy, and then carry the disease secondarily to the child ; this is however probably uncommon, and healthy children are as a rule born in such cases. Here, supposing the male who infects the woman is the father of the child, he infects the child indirectly.

In addition to the supposed results of this disease in the placenta and membranes (see p. 262) the fœtus itself, as already described with regard to its bones, suffers others.

To make as complete a list of the pathological changes as possible, it will be best to take the various systems in order.

Nervous.—No special affections, but gummata occur.

Alimentary.—The mucous membranes of the alimentary canal are sometimes ulcerated, rarely causing much destruction of tissue.

The *liver* is affected by gummatous formations, which may have the characters of isolated nodules, developing, breaking down, or cicatrising ; or of more diffuse damage occurring along the bile-ducts or between the cells, the paths of the ducts becoming changed into bands of cicatricial tissue.

In the *pancreas* gummatous changes of a like distribution to the second variety of those just mentioned as occurring in the liver are occasionally found.

Circulatory.—No special affections beyond those of gummatous changes in the vessels have been described.

Respiratory.—Gummata frequently form in the lungs as isolated or aggregated nodules which break down and possibly cicatrise. These collections are usually near the pleural surface, but the nodules may be universally diffused ; or general small-cell growth may affect the interstitial tissue.

Glandular Tissue, Connective Tissue, and Serous Membranes.

Spleen.—A lardaceous change with considerable enlargement is not rare.

Supra-renals and Thymus.—Very rarely breaking-down gummata are found in the shape of small abscesses.

Connective Tissue.—This may be affected with gummata in any situation.

Serous Membranes.—Ascites and hydrothorax may occur in the course of syphilis. The fluid is often blood-stained.

Osseous (see p. 265).—Epiphysial disease, affection of bones of skull.

Cutaneous.—The changes here are more obvious and characteristic. They almost always consist in pemphigus of the palmar surface of the hands and feet. The vesicles are large, and contain pus or blood-stained fluid. Sometimes the epidermis forming the vesicles is detached in flakes, and their floor is exposed as a large raw surface, which may be healed or not at birth.

Condylomata are occasionally found.

The results of the transmission of this disease to the fœtus, and the gravity of the affection as regards abortion and intra-uterine death, will be found on p. 303, and just below. It should be remembered that there may be no other cause but syphilis to account for death in an apparently healthy child; and further that a child may be born alive and apparently healthy, and in a few days after birth show unmistakable signs of syphilis.

The way the **exanthems** affect the fœtus is considered under the heading of these diseases as they affect the pregnant woman (p. 299).

Intra-uterine Death.—It has been seen that there are many diseases from which the fœtus may suffer while in utero. Some of them may result in its death, and they and other causes of fœtal death may now be classified, with examples of each cause.

1. *Diseases inherent in fœtus.*—Maldevelopment (*e.g.* acardism). Syphilis beginning at the moment of conception.

2. *Starvation.*—Actual starvation of the mother. Diseases of the placenta cutting off the fœtus from the mother's circulation. In the case of twins, one may absorb all the nutriment and squeeze the life out of the other (fœtus papyraceus).

3. *Poisons.*—Zymotic diseases (*e.g.* enterica, syphilis). Chemical poisons (*e.g.* lead).

4. *Violence.*—This cause probably most often acts by means of (2), a sub-placental hæmatoma being formed.

5. *Pyrexia of mother.*—The fœtus is found to die when the mother's temperature reaches 106°F.

When a fœtus dies it may be expelled within a few days, or it may be retained for weeks, or until the uterus is excited to contraction by some other cause than its mere presence (by a twin arriving at full term for instance, or by artificial stimulation of the uterus by a sound).

If a non-viable fœtus dies and is expelled at once the process is included under the heading of Abortion. If expulsion is delayed beyond a few days a condition exists which is known as Missed Abortion.

If a viable fœtus died and was retained in utero for an indefinite period, the condition would be that of Missed Labour.

Cases of long retention (several months) of fœtuses at or near full development have been described. In no case has there been post-mortem evidence that it is an even possible event, and the only facts in support of it are clinical. In a case of Dr. Barnes' he felt the fœtus in utero. There is no evidence at all of a child's having reached maturity, then dying, and being retained in utero indefinitely. Cases which have been recorded as instances of this are

practically beyond doubt cases of an ectopic gestation which has ulcerated through into the uterus, and so gained an exit.

As regards Missed Abortion there is no doubt that this can and does occur. Early cases of death of the ovum before the placenta is formed resulting in the production of a blood-mole have been described (p. 248), and the phenomena of their retention in utero mentioned.

Later on in pregnancy, when the placenta is formed, the death and retention of the ovum result in the production of one of those specimens of mummified fœtus (often wrapped up in the placenta) which are to be seen in museums ; or in maceration of the fœtus and placenta. If the fœtus and placenta are mummified when the liquor amnii is absorbed, the mass is found to be a more or less dried up fœtus, with the placenta looking like a piece of dirty brown leather wrapped round it.

If the process has been one of maceration the bones are found loose in the skin, and the epidermis of the latter is partially or entirely separated. The tissues are œdematous and pulpy, the serous cavities often contain brownish fluid, and the fœtus can be squeezed up into almost any shape. Putrefaction may have occurred too, but this is not common.

The events which may occur in the case of one fœtus dying in twin pregnancy have been mentioned. There, since there is one living ovum to exercise its influence on the growth of the uterus, little or no disturbance occurs to the course of the gestation.

When there is only one ovum, its death does away with all reason for the continuance and development of the functions peculiar to pregnancy.

The clinical history in this case is something like the following :—

A woman who has had the symptoms of pregnancy for from two to three months or more, and who may or may not be affected with syphilis or some other condition which causes death of the fœtus, finds that the gestation-symptoms cease. Vomiting if present disappears, the breasts become flaccid, and the abdomen, if it has begun to enlarge, does so no longer. If quickening has occurred, movements are not again felt.

She probably thinks that she was mistaken in her opinion and was never pregnant. Menstruation does not appear, but if maceration occurs, there is a dirty brown discharge, or there may be also occasional hæmorrhages.

At examinations made at intervals, the uterus is found not to be growing, although it may have been previously established that it was pregnant with a living ovum. If the fœtal heart has been heard, it is now inaudible.

Then, usually about the seventh month or so from the commencement of the pregnancy, the mummified or macerated ovum is expelled. It may, however, be retained until the ninth month.

The woman's health may or may not be affected by this accident ; but if putrefaction occurs, there is risk of septic absorption.

Treatment.—In any case, and immediately if symptoms of septic absorption are present, the uterus should be emptied when a diagnosis of dead fœtus has been made.

The best way is to pass a sound, rotate it once or twice in the uterine cavity, and give ʒj doses of ergot every two hours for ten or twelve hours. If there is no result from this, the cervix should be rapidly dilated and the

uterus evacuated by the finger. It is as well to avoid the use of tents if there is any sign of putrefaction or septic absorption, for they tend to cause an increase in the latter process, owing to the retention of septic matter in contact with the mucous surfaces during dilatation, which process also involves the risk of abrasions of these surfaces. By rapid dilatation absorption is avoided, since, if carried out with antiseptic precautions, this method ensures the immediate removal of the septic matter. Hegar's dilators (p. 357) are the most useful instruments to employ. The vagina should be frequently irrigated with a solution of sublimate (1–2,000) or other reliable antiseptic of corresponding strength ; and it is well to apply iodised phenol or pure carbolic acid to the interior of the uterus.

CHAPTER XL

AFFECTIONS OF THE MATERNAL ORGANISM DIRECTLY CONNECTED WITH PREGNANCY

A.—GENERATIVE ORGANS :—*Versions and Flexions of the Gravid Uterus*

ANTEVERSION AND FLEXION. PENDULOUS BELLY

THE gravid uterus is normally anteflexed during the early months of pregnancy ; but later on the elasticity of the anterior abdominal walls tends to bring the fundus as it rises more and more vertically over the lower part of the uterus. If by previous pregnancies or from other causes, the abdominal muscles and fasciæ have become relaxed, they do not keep the fundus back, and anteversion and anteflexion continue.

Anteflexion and version before the fundus is above the brim are of no importance.

The displacement may be of a moderate degree only, rendering the abdomen abnormally prominent, or it may be so severe that the uterus overhangs the pubes ; and its fundus may even be below the level of the cervix.

Causation.—(*a*) Laxity of the abdominal walls, as found in multiparæ, combined with a contracted pelvis, is the most frequent cause, though a contracted pelvis alone may bring about forward displacement, and cause the abdominal wall to yield even in a primipara.

The way in which this happens is as follows. The head of the fœtus cannot enter the brim to the normal extent, and the lower segment of the uterus is thus not fixed, but may be rotated in any direction. Gravity and the intra-abdominal pressure, aided by the downward and forward pressure of the diaphragm, force the raised body of the uterus forwards and downwards, and the abdominal wall yields to some extent. If now it has been weakened by previous labours, and more especially if there is any separation between

the recti (diastema), its yielding may go on to an almost unlimited extent, the greatest degree of projection being attained if the uterus forces its way between the recti and is held up only by skin and the stretched remains of the aponeurosis between the two recti muscles. Under these circumstances the protruding uterus has been found resting on the patient's thighs.

Lax abdominal walls alone occurring after many pregnancies, with or without marked diastema, will allow the uterus to fall forwards to a greater degree than normal, and various degrees of prominence are thus produced.

(*b*) In cases of the irregular lordosis which is often combined with osteomalacia and spondylolisthesis (see pp. 449 and 452), the uterus is pushed forward by the lumbar vertebræ, and this will, of course, much increase any existing displacement.

(*c*) The abdominal space is diminished in cases of scoliosis, and the diaphragm actively forces the fundus forwards.

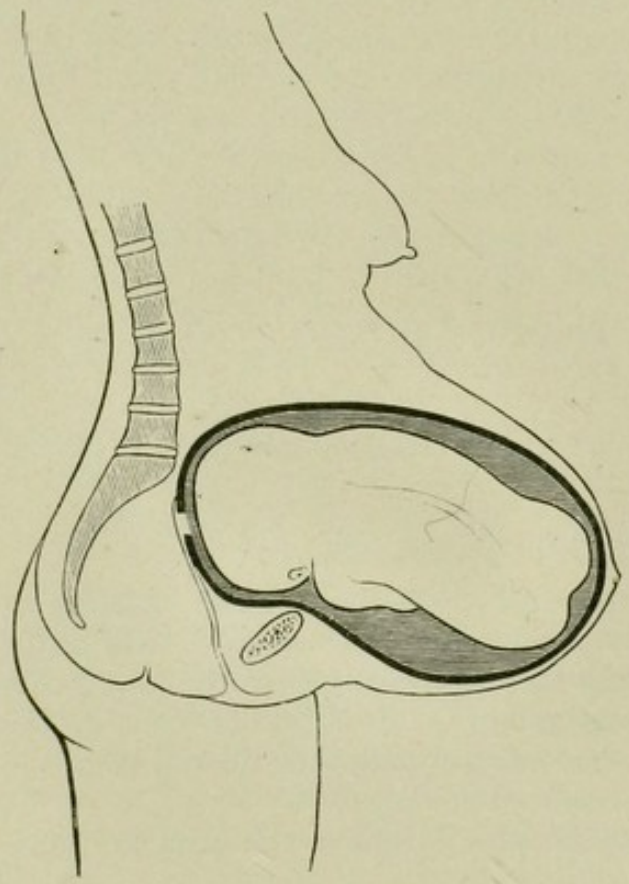

Fig. 247.—Pendulous belly.

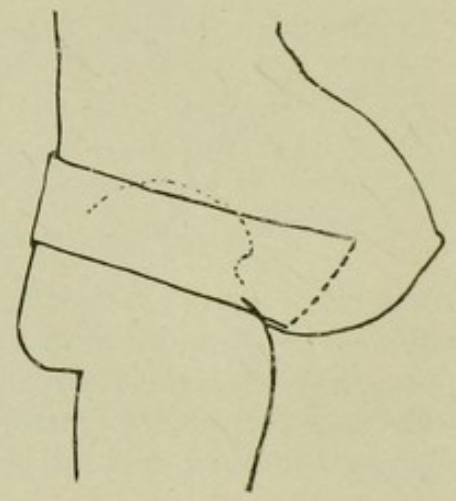

Fig. 248.—Pendulous belly, showing the direction of the pull of the abdominal belt. It may be necessary to make it reach higher than shown here.

Symptoms. Signs.—The patient suffers from dragging on the abdominal wall, and walking may be rendered difficult. Frequent micturition sometimes but rarely occurs.

On vaginal examination the cervix is found to be high up in the posterior part of the pelvis, and to be looking backwards.

Very great inconvenience may be caused by erythema intertrigo in the folds of skin above the pubes ; and œdema of the abdominal wall is described as occurring in some cases.

Results.—The most important effect, because it is the commonest, and results from slighter degrees of the displacement, is prolongation of labour (see p. 407).

Pendulous belly is also a cause of abnormal presentation. The head during labour does not enter the brim, but glides over it ; and the side of the head presents. Of course, any contraction of the pelvis aids materially

in producing this result. Rupture of the vagina or uterus may occur if the head is made in this way to distend the vagina or to grind the posterior wall of the lower uterine segment against the promontory (see fig. 247).

Treatment.—No pessary or internal support is of the least use in cases of anteversion. As already mentioned, anteflexion is normal in early pregnancy, and later on it is obvious that no instrument acting from the vaginal walls could have any effect.

A carefully fitted abdominal belt is the only treatment. This should give support to the hypogastrium from both below and above the crest of the ilium (fig. 248) and pull upwards and backwards in the plane of the brim.

Retroversion and Flexion

This abnormality consists in displacement of the fundus of the gravid uterus backwards, and as the two conditions of version and flexion are nearly always combined, they may be considered together. In a few rare cases the flexion seems the more prominent symptom.

Causation.—In nearly all cases the displacement of the uterus has existed before impregnation, but has given rise to no symptoms if the organ has been healthy and not enlarged. It may also, but more rarely, be due to a fall on the sacrum when the uterus is already retroverted—so far retroverted at all events as to lie in the axis of the woman's trunk. A normally situated uterus probably cannot be retroverted or flexed more than momentarily by any fall. A bladder habitually allowed to become over-full may have some influence in producing some degree of retroversion ; but again, a full bladder alone cannot cause the malposition.

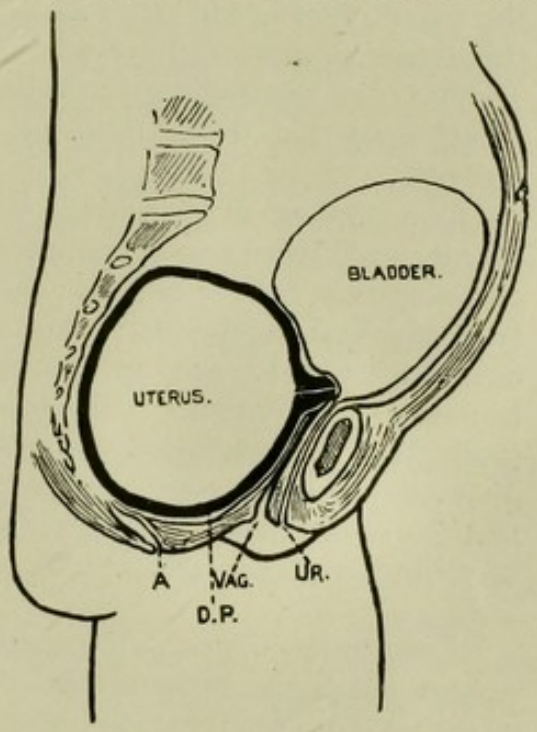

Fig. 249.—Retroverted gravid uterus, showing distended bladder. *A*, anus; *D P*, Douglas' pouch ; *Vag*, vagina ; *Ur*, urethral orifice (which is more drawn upwards than is shown in the diagram).

Anatomy and Mode of Production.—As long as the uterus does not measure more than four inches or so in length, there is room for it to lie across the axis of the pelvis. When, however, its length exceeds that of the pelvic diameter in which it lies, and there is a corresponding increase in bulk, it becomes too large for the pelvis, and begins to cause pressure symptoms of a marked character. When upward movement is prevented by the projecting promontory the uterus is said to be *incarcerated.* Incarceration usually occurs about the end of the third or beginning of the fourth month.

The position of affairs is as shown in the diagram. The fundus occupies the hollow of the sacrum, and distends Douglas' Pouch and the posterior fornix, so as to make the latter bulge forwards towards the vulva ; and if a

vaginal examination be made in a well-marked case, the posterior wall, with its surface made very convex forward, is the first thing the finger touches after passing the vulva. The cervix is, under these circumstances, not felt until the finger is passed up behind the symphysis. There is produced in this way a great distortion of the anterior vaginal wall, which is dragged up by the displaced cervix and assumes a vertical position. This in itself is of no importance, but it will be remembered that the urethra and base of the bladder are so much a part of the anterior vaginal wall that they follow it in all its displacements. Consequently the upper end of the urethra and the base of the bladder are dragged up too, the walls of the former being stretched and distorted to a variable extent, and its canal considerably narrowed or even occluded. In addition to this the fundus, being prevented from growing backwards by the resisting sacrum, causes the cervix to press against the back of the symphysis or against the stretched pubo-vesical ligaments ; the urethra thus suffers a direct transverse pressure, and eventually becomes entirely blocked. Retention of urine is now produced.

Owing to the incarceration of the uterus, the veins returning the blood from it and lying in the broad ligament (ovarian plexus, pampiniform plexus) are compressed, and the fundus may become œdematous.

There is of course no fundus to be found in the situation proper to it in the fourth month, but often its place is taken by the distended bladder, and this is very important to remember.

The cervix is often not in a line with the axis of the uterine body, but is flexed somewhat downwards. It practically never has its normal direction, however.

In a case of displacement backwards, which exists at a time when the uterus is not large enough to cause any marked symptoms, events may follow one of two alternative courses ; the commoner alternative being that the uterus as it develops regains its normal position, no doubt by growing in the direction of least resistance, up into the abdomen[1] ; or it remains retroverted and becomes incarcerated. The natural restoration occurs, as will be understood, gradually ; though this is not always the case, and a patient who had, on a given day, a retroverted gravid uterus may be examined a few days later and found to be free from the displacement. Incarceration is most liable to occur in flat pelves (see p. 428).

Symptoms.—During the early weeks of pregnancy the retroversion causes much the same symptoms as are produced by a subinvoluted and retroverted uterus ; namely, sensations of weight and bearing-down pains in the pelvis, and frequency of micturition. These go on increasing in severity until restoration, if it is to take place, is accomplished. When incarceration has occurred the uterus, if it has not previously relieved itself by abortion, as sometimes happens, may do so now, and put an end to the trouble altogether ; or, less frequently, may even at this stage right itself spontaneously. Abortion is no doubt caused by the growth of the ovum and increase of liquor

[1] The method of restoration in this case resembles the mode in which a half-filled bladder may be passed through a key-hole. A small portion of empty bladder can first be passed through, and some of the fluid squeezed through into this part, and then the rest coaxed through in the same way.

amnii. Since the increase in bulk cannot occur in the normal direction by expansion of the uterus, the ovum is forced against and through the internal os and cervix, and contractions are started in this way. The mode of production of the symptoms is sufficiently obvious to need no explanation. Supposing that the uterus continues to grow, however, no relief comes to the symptoms, but they steadily, and in some cases rapidly, become alarming ; the woman finds herself unable to pass water, often quite suddenly, but perhaps after having succeeded once or twice with great difficulty. The bladder fills ; then becomes over-full, and the urine begins to dribble away. After a varying time cystitis develops, and the inflammation and the diminished blood-supply due to over-distension cause sloughing of the mucous membrane, which becomes detached in larger or smaller flakes ; or possibly gangrene of some of the muscular coat may take place.

The bladder changes may spread in the usual way to the renal pelvis and cause 'surgical kidney,' and the patient may thus die of septicæmia or in the uræmic state.

The urinary symptoms have been pursued to their termination at once, so as to lay stress on their importance ; and it must never be forgotten that the effects on the bladder are by far the most characteristic phenomena in cases of incarceration of the gravid uterus. In addition, the bearing-down pains increase and radiate in all directions, rectal tenesmus is severe in many cases, and the bowels are unable to act. Vomiting often occurs in bad cases, and the abdomen becomes distended and painful, from the condition of the bladder. The body of the uterus gets lower and lower, from the frequent bearing-down efforts, and may bulge the posterior vaginal wall through the vulva and even cause the anterior wall of the rectum to project through the anus. In consequence the cervix mounts higher and becomes more inaccessible.

Œdema of the vulva is frequent, and occasionally the thighs suffer in the same way.

Diagnosis.—The nature of the case is readily cleared up, in the majority of instances of retroversion of the gravid uterus, when symptoms of incarceration have appeared, and an examination is made.

The history of retention and dribbling of urine in a woman who has had the symptoms and signs of pregnancy for three or perhaps four months ; the round, elastic, and very likely rather doughy-feeling mass occupying the vagina ; the position of the cervix and, most important, its upward direction, are practically conclusive ; and as the distended bladder will be expected it will not cause any uncertainty. In the cases of retroflexion (to be described), it is true the cervix may point downwards, but a careful examination after emptying the bladder with a catheter will, in these rare cases, clear up the doubt, and bimanual examination is here most useful. This latter method will serve, by defining the position and size of the uterus, and especially by making out uterine contractions, to distinguish cases of displacement of the gravid uterus from instances of tubal gestation, of an intra-ligamentous cyst pushing the uterus upwards and forwards, or from large intra-peritoneal hæmatoceles, which have the same effect. In all these cases, except that of tubal gestation, there are no signs of pregnancy ; in all

the cervix points downwards, although it may be jammed against the symphysis, and the unimpregnated uterus can be made out immediately over it (fig. 250) ; and in the last-mentioned kind of tumour the mass will be hard, inelastic, and quite fixed. In the diagnosis from tubal gestation uterine contractions, if felt in the tumour behind the cervix, are most valuable evidence, since in ectopic gestation signs of pregnancy may be present. The uterus, enlarged by a fibroid to the size of a four months' pregnancy and retroverted, will be readily distinguished by its long and characteristic history and by its hardness, and by the absence of contraction and relaxation ; though in some cases of this disease there may have been no hæmorrhage, and the œdema of a fibrous uterus so displaced may cause extreme softening, or the fibroid itself may be very soft and make the diagnosis by means of local signs somewhat uncertain.

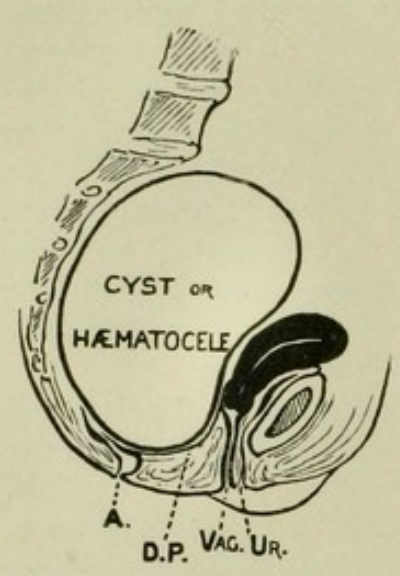

Fig 250.—*A*, anus ; *D P*, floor of Douglas' pouch ; *Vag*, vaginal orifice ; *Ur*, urethral orifice.

Earlier stages of retroversion of the gravid uterus may be confused with, among other things, retroverted sub-involuted uterus, a perimetritic mass adherent to the back of a retroverted uterus, a fibroid in the posterior uterine wall with retroversion and adhesions.

In these last cases of small tumours, since no urgent danger is to be apprehended for a week or so the patient may be kept in bed ; and she may then be examined again, if necessary, under an anæsthetic.

Treatment.—If bearing-down pains and frequent micturition direct attention to the uterus of a pregnant woman, and it is found to be retroverted, the uterus should be restored, and a ring-pessary or a Hodge's pessary inserted until the gravid uterus is too large (four to four and a half months) to retrovert again. Any threatening of abortion will, of course, be attended to.

If incarceration has occurred, no violent means must be used to reduce the displacement. The sooner it is done, however, the better.

The urine should be first drawn off with a catheter. In doing this the direction of the urethra must be remembered (fig. 249), and care be taken to use no force, especially if the course of the urethral passage is not easily found. A gum-elastic catheter is the best. If it be found impossible to pass the instrument, even after putting the patient on her hands and knees so as to try to raise the fundus uteri and take the pressure of the cervix off the urethra, or by pressing the cervix backwards with a finger on each side of it, an attempt may be made to reduce the uterus while the bladder is still full. This is hardly likely to be entirely successful, but even if partially so, it may enable the catheter to pass. If neither the catheter will pass, nor the uterus move, the bladder must be aspirated about two inches above the pubes.

An anæsthetic is of great advantage, though not absolutely necessary at once, as there may eventually turn out to be little or no difficulty in restoration. It must be understood that all operative measures are to be

conducted under strict antiseptic precautions. To reduce the uterus the patient may be placed in the semi-prone position, and the first two fingers of the right hand (well pronated, so that the palmar surface presses against the mass) introduced into the vagina, the perinæum being retracted so as to admit air. Firm pressure may now cause a sensation of yielding, though the surface of the mass often indents considerably without any real movement. If the mass is felt to move more readily towards one sacro-iliac diameter than upwards in the middle line, this movement should be favoured. If success is not attained in this position the patient should now get, or if anæsthetised, be lifted, into the genu-pectoral position. The perinæum should be freely stretched backwards as before to allow air to enter the vagina, and to enable gravity to act on the uterus, pressure again being made in the direction of the brim. This failing, the whole hand may be passed into the vagina to make the pressure. If still there is no success, two fingers in the rectum will have the advantage of increased leverage on the mass, and a volsella may be fixed in the cervix to pull this part backwards and downwards.

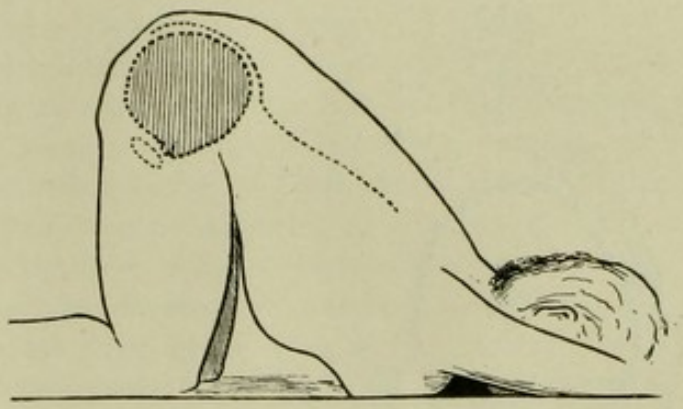

Fig. 251.—Effect of gravity on the retroverted uterus in the knee-elbow posture.

No great force must be used for fear of damaging the ovum, and because, although it is a rare condition, there may be adhesions binding the uterus down.

Supposing now that all these methods have failed, the next step depends on the patient's condition. If it is very urgent, and the bladder is inflamed, the uterus must be emptied. If not, the patient may be put back to bed and regularly catheterised, lying on the abdomen or in the semi-prone position as much as possible, for a few days, in the hope that, as not rarely happens, the uterus will right itself.

This event may be assisted considerably by the use of hydrostatic elastic bags in the vagina, or if it can be borne, in the rectum, during this period. After a week, supposing no indications for immediate interference have arisen in the meantime, the methods described above for attempting reduction should be again resorted to. If they still fail (or in case the symptoms are urgent at first) a bougie should be introduced through the cervix (see Induction of Labour). This proceeding is often difficult on account of the angle the vagina and cervix make with one another. The latter must be caught with a volsella and pulled down as far as possible, and then the bougie can be introduced with a little manipulation. If the membranes are ruptured in the process it cannot be helped, and as a matter of fact this is recommended by many authors.

In cases where the cervix is impermeable it is necessary to aspirate the uterus through the posterior vaginal wall, the needle being passed into the most prominent part per vaginam. In either case, when pains begin and

the liquor amnii has to some extent run away, the uterus should be restored at the earliest opportunity.

The cases consisting mainly in *Flexion* backwards are very rare.

The uterus is here doubled up so that the fundus attains the position of the incarcerated organ as just described ; but the cervix, although occupying a situation immediately behind the upper part of the pubes, has a fairly normal direction. The anterior uterine wall is bulged upwards and occupies the lower part of the abdomen, and contains most of the fœtus. The condition is probably due to an incomplete restoration of the retroflexed and retroverted organ. The most frequent result in these cases is for the uterus to right itself eventually. It may, however, give rise to symptoms of incarceration, and premature labour may follow.

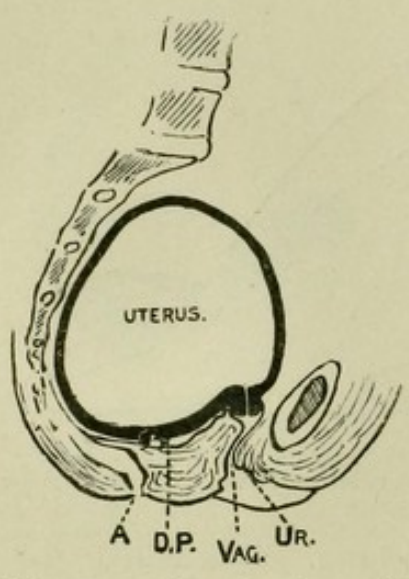

Fig. 252. — Retroflexed gravid uterus. Note the direction of the cervix. *A*, anus ; *D P*, Douglas' pouch ; *Vag*, vagina ; *Ur*, urethral orifice.

Considerable difficulties occur in labour (if the case, as has happened, goes to term) as well as in abortion. The cervix is out of the axis both of the uterus and of the pelvis, and dilatation is almost impossible. Restoration has been known to take place even at full term. If labour is to be completed at all, some sort of accommodation of the axis of the uterus to that of the brim must take place, and probably in most cases the fundus will be pushed up by the physician during delivery.

Sacciform Dilatation of the Lower Segment.—This is not very uncommon in the case of the anterior wall, and is merely an exaggeration of the normal condition (see fig. 61, p. 45). The importance of dilatation of the posterior wall is not great, and there is need for treatment during labour only if the fœtus happens to be forced into the dilated part rather than through the cervix. When the anterior wall is dilated, the os is further back than normal, and lies against the sacrum, sometimes very high up and in an almost inaccessible situation. This condition is found in connection with descent of the fœtus into the pelvis before the pains begin (Spiegelberg). The difficulty of finding the cervix has caused the mistake to be made of incising the anterior uterine wall per vaginam under the impression that occlusion of the cervix existed. (For treatment, see Pathology of Labour, p. 454.)

Prolapse of the Pregnant Uterus.—This can only take place in the quite early months while the uterine body is small enough to slip between the two edges of the levator ani. Such an escape can only occur in the case of an organ already retroverted, and with lax ligaments ; in fact, in a uterus which has been prolapsed for some time before.

Pregnancy may occur in a uterus which is already partially or completely prolapsed. In the former case its increasing size presently causes it to rise

in the pelvis and assume its normal position. If there is much retroversion the symptoms may develop into those of retroverted gravid uterus.

If reduction does not spontaneously occur, or is not artificially produced, the pregnancy may go on for a few months—three or four (in one case it went to the sixth month)[1] ; but the bladder and urethra become too much displaced for further growth of the uterus, and the vaginal walls will probably not undergo dilatation to the necessary extent without sloughing, since they are inverted and their circulation is much interfered with.

If the body of the uterus remains in the pelvic cavity after the first two or three months it may grow for a month or two longer, but then becomes incarcerated. This failure to rise is, however, almost unknown.

Hypertrophies of the cervix are most likely to lead to the idea that the body is lower than it really is. There may be congenital elongation of the portio vaginalis (fig. 456) ; or an elongation of the supra-vaginal portion such as occurs in old cases of prolapse of the vagina. The cervix in these cases may project to even beyond the vulva, this body being at the normal level, and in the case of supra-vaginal elongation the inverted vagina will conceal the real position of the body.

Treatment.—If the case is seen in the early weeks the prolapse must be reduced and the uterus retained in position by tampons and a perineal bandage ; or more conveniently by a ring pessary. This will not be needed longer than the fourth month. The uterus should be carefully watched during this time lest retroversion and incarceration occur. The bowels should be kept freely open, and all bearing-down or straining efforts avoided. If the patient is not seen till later, and some wedging has occurred, the uterus must be elevated, under an anæsthetic if necessary, and care must be taken that at the end of the operation the fundus is above the pelvic brim and looking fórwards. Where reduction is impossible at the first attempt, a further one may be made, if the uterus has not spontaneously risen, after a few days' rest in bed. In case of failure now, or before now if pressing symptoms have arisen, abortion should be induced.

Prolapse of the Vagina.—This is fairly common in patients who have suffered from the same condition in the unimpregnated state. It affects the anterior wall alone in a very large majority of cases.

The trouble here is the effect on the bladder, which is bulged downwards so as to form a cystocele ; and difficulty and frequency of micturition are caused. The veins on the under surface of the urethra (see fig. 62) are often much distended and sometimes cause great discomfort and irritation.

The best treatment is the insertion of a small vaginal tampon soaked in glycerin. acid. tannici, renewed twice daily. This is supported by a perineal bandage. A ring pessary is not of much use here, but a trial may be given to it, as it causes less discomfort than the tampons. Care must be taken that the tampons do not induce abortion, and any tendency on the part of the woman to easily abort is a contra-indication to their employment ; for effect on labour, see p. 457.

[1] Tarnier. Also in a case seen by the author.

Hernia of the Pregnant Uterus

This condition is so rare that it hardly needs more than simple mention. Separation of the recti muscles, as shown under the heading of Anteversion of the Gravid Uterus in the present chapter, sometimes allows the uterus to fall into what is almost a hernial sac. The uterus has been found, when gravid, to have its fundus in an umbilical hernia, or protruding into the pouch of a yielded cicatrix, such as sometimes occurs after abdominal section

The gravid uterus has been found also in an inguinal and even, according to old writers, in a femoral hernial sac.

In the last two classes of case, in which pregnancy never goes to term, some operation on the inguinal or femoral canal may be necessary after evacuation of the uterus, either through the vagina or by hysterotomy ; in the others the support of an abdominal belt is all that is necessary.

Pregnancy in a Maldeveloped Uterus.—The effects of maldevelopments of the uterus and vagina are more marked in labour than in pregnancy ; the most important abnormalities are described at p. 293. Pregnancy in a Rudimentary Horn is dealt with under Ectopic Gestation.

CHAPTER XLI

AFFECTIONS DIRECTLY CONNECTED WITH PREGNANCY—*continued*

B.—Other than Generative Organs

Nervous System

Insanity.—The subject of insanity in connection with pregnancy, labour and lying-in is discussed under the Pathology of the Puerperium (p. 556).

Chorea.—Chorea occasionally occurs during pregnancy, and is often then continued into the lying-in period. It is a very interesting fact that the existence of pregnancy makes it possible for a woman to have a disease which is otherwise almost exclusively one affecting little girls. A woman, if pregnant, may have chorea at any time up to the age of even twenty-six or twenty-seven. Also, contrary to its habit in children, the disease is frequently severe in its manifestations and results.

It leads in many cases to abortion or premature labour, and although a woman after one pregnancy complicated with chorea will be free in the non-gravid intervals, she may suffer during the next pregnancy from a recurrence of the disorder. This last fact illustrates, and its existence is rendered possible by, the impressionable nervous condition already described as normally existing during pregnancy.

Chorea during pregnancy has until comparatively lately been regarded as a rare and fatal disorder. Spiegelberg, in his very large experience, says

he has only seen three cases. But in a recent paper[1] its author records four cases observed during a period of six months. This discrepancy is due, no doubt, to the absence of former record of any but severe cases, and possibly to mistakes in diagnosis. From the author's personal experience, a greater frequency than was formerly held to occur can be affirmed.[2]

Causation and Mode of Origin.—Omitting the discussion of the various theories of the pathology of chorea, the following statements may be made. Chorea alone is found to have occurred previously in rather more than one-third of the cases, rheumatic fever with or without chorea in about the same proportion, and the attack has been preceded by fright alone or mental disturbance in a very few.[3]

Malnutrition has great influence in impairing the nervous function, and so the hydræmia of pregnancy partially accounts for the prevalence of chorea at that period.

Symptoms and Course.—Chorea, like the commoner disorder, albuminuric eclampsia, almost invariably occurs for the first time during a first pregnancy. If an attack of rheumatic fever has intervened between a first pregnancy which has been healthy and a second, chorea may occur for the first time in the second.

It may or may not recur in successive pregnancies.

The first symptoms usually appear from about the third to the fifth month —very few towards the end of pregnancy. Quickening has been observed to coincide in a few cases with the commencement of an attack, and probably the increased irritation of the nervous centres caused by the fœtal movements is the reason; at this period, too, the chorea if already existing is often intensified.

The clonic spasms are as a rule severer than in children, and if they are severe and continuous they soon lead to exhaustion of the patient; and in such cases abortion often occurs.

The choreic movements almost invariably persist until after delivery, when gradually, and not at once as usually happens in eclampsia, they cease in moderately mild cases. If the attack is not a mild one, the woman may die of exhaustion before or after delivery; or from abortion; or she may become maniacal.

Death is probably due in a majority of cases to complications. In the two fatal cases alluded to as happening in St. George's, there was acute endocarditis, and the temperature ran up to 106° to 108° before death.

If the fœtus is not prematurely expelled, it seems as a rule to be none the worse for its mother's condition.

Chorea very rarely, if ever, arises anew after delivery, and many of the cases so described are probably best accounted for as reappearances of a chorea which existed unnoticed before labour began.

The reflex excitement of the system by suckling may in some cases

[1] McCann. 'Chorea in Pregnancy,' *Obst. Trans.* vol. xxxiii.' 91.

[2] Three cases in two years. Two fatal, in St. George's Hospital, one mild, in the General Lying-in Hospital.

[3] McCann. *Ibid.*

accentuate spasms already existing, or may be a cause of the reappearance just referred to.

Treatment.—In mild cases the patient's strength must be maintained by nourishing food, stimulants, and iron and arsenic.

In severe cases, especially where the woman does not sleep, premature labour should be induced at once. This is very necessary, for such patients go to pieces rapidly when the disorder is severe; and when a mild attack shows signs of getting worse, hesitation should not be for long.

Another reason for not hesitating is that the disease goes on for some time after delivery, so that the birth of the child does not make the mother safe; and, further, mania is not very uncommon in these cases; and probably the earlier labour is induced, the less chance there is of this complication. Mania may, however, be a quite early addition to the symptoms, and will increase the urgency of the case, and the necessity for immediate induction of labour. (See Insanity, p. 556.)

Eclampsia.—See Pathology of Labour (p. 508).

Tetany.—Tetany occurs very rarely during pregnancy. It is commoner in the lying-in and nursing periods, and is discussed in the Pathology of the Puerperium.

Pruritus.—Itching of the vulva in varying degrees is not uncommon during pregnancy, especially in women who lead indolent lives, or in those who are neurotic in disposition. In the latter the pruritus may affect other parts of the surface of the body.

It is not always a neurosis, and care must be taken to eliminate eczema and pediculi as causes, and to see that there is not some redness due to irritation of the vaginal orifice by leucorrhœal discharge. The treatment is to keep the bowels regularly and fairly freely acting, and to apply some astringent anodyne locally. The patient must not scratch or rub the part. A very useful application is a 1–2000 or 1–4000 solution of corrosive sublimate, and this will be found more effectual if used hot. A 1–40 solution of carbolic acid is sometimes successful. Other astringents in common use may be employed, and absorbent wool or lint wetted with them worn constantly applied to the vaginal orifice. If no relief is obtained from astringents, a solution of cocain hydrochlorate, 4 gr. to the oz., may be used when the irritation, which is usually intermittent, occurs.

Circulatory System

Anæmia.—In some cases this is simply an exaggeration of the hydræmia which prevails in nearly all pregnancies. It is then treated in the ordinary way with saline aperients and continuous doses of iron, or iron and arsenic.

There is another form of anæmia, that named Pernicious, or Progressive, which, common to both sexes, is rather inclined to affect pregnant women. It is, in this country at all events, a rare disease.

The blood-changes (poikilo-cytosis) and hæmorrhages into the retina and other parts, occur as in the ordinary type of the disease; and the fatality may be as great as in cases independent of pregnancy.

It causes abortion or, more commonly, premature labour in about half the women affected by it,[1] and the blood lost at labour may be enough to precipitate death.

In all cases of anæmia during pregnancy which do not yield fairly rapidly to treatment, or which get worse, a microscopic examination of the blood should on no account be omitted, and if the forms of corpuscles characteristic of Pernicious Anæmia are found, and especially if there are any retinal hæmorrhages, labour should be induced after a consultation.

Obstruction to Venous Return.—Owing to pressure by the growing uterus on the larger venous trunks of the pelvis, varicose veins are frequently developed in pregnant women. They present varying degrees of severity, and affect the upper part of the thighs and the lower part of the buttocks to a much greater extent than in cases apart from pregnancy. Occasionally thrombi form in the dilated vessels ; and rupture sometimes takes place.

The labia majora and vagina are often the seat of this affection ; and in rare instances rupture of the veins of the lower part of the vagina during labour takes place, forming the 'vaginal thrombus' of the older writers.

The small knot of varicose veins which so often forms just under the urethra has been already mentioned.

Treatment.—The ordinary treatment of this condition—keeping the limbs raised as much as possible, and where necessary using elastic stockings or Martin's bandages—will be enough in nearly all cases. Excision of the veins is not an operation to be undertaken during pregnancy, for after delivery the veins recover themselves, sometimes almost completely ; and operations during pregnancy, though quite justifiable where real need exists, always involve the risk of abortion.

The patient should be instructed what to do in case rupture does occur ; that is, to lie on her back at once and elevate the limb, if a vein of the leg has ruptured ; and to have a pad and pressure applied to the bleeding point wherever it is.

If the dilated veins are in the vulvar region, a pad of some fairly elastic material, such as cotton-wool, should be made to support the part by means of a perineal band. (For 'Thrombus of the Vagina,' see Labour.) Attention to the action of the bowels is of great importance.

Piles are also a common accompaniment of pregnancy, and in some cases cause much discomfort. Their causation is the same as that of varicose veins in the legs, combined with the constipation usual in gravid women. They must be treated on the ordinary palliative principles ; more radical measures are practically never called for.

Œdema has been mentioned as occurring in normal pregnancy. It is never, except in cases of renal disease or intense anæmia, a matter calling for special treatment.

[1] Graefe, Halle, 1880.

Digestive System

Vomiting. Pernicious Vomiting of Pregnancy.—It is impossible to draw any well-marked line between what may be considered a physiological and what a morbid degree of this disturbance, though the extreme instances of each are well contrasted.

Normally, about fifty per cent. of pregnant women are sick occasionally during the second, third, and perhaps fourth months of pregnancy. In cases which may be called pathological the vomiting may occur during this time, and be so urgent that the stomach retains nothing; or it may persist with severity when it should, under normal conditions, cease.

Causation.—In a few cases vomiting is due to a complication already existing, such as gastric ulcer, new growths affecting the gastric mucous membrane, renal disease, cerebral affections, and so on; but in the majority of cases no such cause can be assigned.

The affection is commoner in first or second pregnancies than in later ones. Formerly the various flexions which may affect the cervix; or displacements of the uterus; or circum-uterine inflammation have each been assigned as a cause, and treatment has been actively applied in accordance with such views. No proof, however, exists that these conditions have anything to do with the vomiting, pernicious or otherwise, since they are present in a large proportion of cases where no vomiting exists; and, as just mentioned, in the majority of instances there is no physical cause at all to be found. Constipation is a frequent accompaniment, however, and possibly an important one. Acute atrophy of the liver, a very rare disease, has been found in connection with vomiting.

Symptoms and Progress.—If the vomiting is not excessively severe, and it ceases at the usual time or soon after it, the pregnancy will go on uninterruptedly; and the woman will recover her strength, which may have been considerably lessened, in a very short time. If, however, the disorder is extremely severe, so that little or nothing is retained by the stomach, and attacks of retching and vomiting come on independently of food, exhausting an already enfeebled patient; or if the disorder goes on for more than the usual two or three months, even moderately severely, the patient in the former case soon, in the latter eventually, arrives at a dangerous point. In her progress to this she becomes wasted and hollow-eyed, possibly slightly jaundiced, her breath gets foul, and her tongue dry and raw-looking. The urine, owing to the small amount of liquid absorbed, is scanty and high-coloured (in the cases where acute atrophy is present it contains leucin and tyrosin), and for the same reason, the woman has a most distressing thirst. There is often some fever. She may continue in this condition for an unexpectedly long time, without further deterioration; she may suddenly recover, the vomiting ceasing completely; or she may rapidly fall into a moribund state, death being due to exhaustion, to some intercurrent disease such as phthisis, or to the sudden increased strain on the nervous system and the loss of blood caused by abortion, which often takes place at the end. Abortion may occasionally occur earlier, and in time to save the

patient's life, for it is a constantly observed fact that the death of the fœtus in utero, or the delivery of the mother, puts an end to the vomiting.

In cases of vomiting late in pregnancy, the possibility of its being due to renal disease should always be borne in mind.

Treatment.—Since there is no evidence that local pelvic conditions have anything to do with pernicious vomiting, no treatment will be directed to these parts as a matter of routine. It will be well, however, to make an examination of the pelvic organs, so as to eliminate the possibility of disease there, for no doubt acute attacks of vomiting may be caused by incarceration (not merely retroversion) of the gravid uterus, or, as another instance, by the pressure of tumours on the gut or the ureters.

As a rule, the treatment must be directed to dieting the patient, attending to the bowels, and keeping her at rest lying down. She should have all her food cold, at short intervals, and in very readily digested form. The best way in severe cases is to give milk, iced or not, meat-broths, or meat-juices (extracts are of no use for nutritive purposes) in small quantities every quarter of an hour or so. Some patients retain very hot liquids well. Some or all of the food may be peptonised, partially or completely, if the patient seems to retain little or nothing, in the hope that anything that does pass the pylorus may the more rapidly undergo complete digestion and be absorbed. Nutrient suppositories or enemata should be used early. Care should be taken that she has enough sleep, and the ordinary sedatives (excepting opium, because of its effect on the bowels) may be given for this.

The bowels must be carefully regulated, and saline purges are probably the best for this purpose.

The intense thirst may be relieved by large enemata of warm water. If the patient gains ground under the treatment, she may probably tide over the tendency to vomiting.

Other therapeutic measures are sedatives such as bismuth, ice, or hydrocyanic acid ; but it may be said at once that they are of very little good. One-minim doses of tr. iodi in a little water every half-hour have occasionally a very marked effect, as they have in some other cases of constant sickness. Ice to the epigastrium, or a blister there, may be tried.

If there is no other cause but pregnancy, and in spite of every attempt to stop the sickness and improve the strength, the patient is losing ground, the uterus should be emptied. This should never, of course, be done too soon : but the tendency in most cases will be to leave this resource until too late. If leucin and tyrosin are in the urine, with other suggestions of acute atrophy, there should be no hesitation. It is very rarely indeed that recourse will have to be had to this extreme measure. Remembering the fact that vomiting sometimes disappears spontaneously at the fourth month, or soon after, the patient, in cases of early severe vomiting, should, if going on moderately well, be kept up in health till that time by the means above mentioned. If no cessation occurs and her condition is becoming worse, abortion should be induced at once. If this operation is left too long, it may be impossible by it to save the patient's life, and its performance may, indeed, accelerate her death.

Nothing has yet been said about treatment applied to the cervix. Cope-

man's treatment by dilating the internal os with the finger or by bougies has been recommended. It is, however, better to induce abortion at once if radical interference is necessary. Other kinds of treatment applied to the cervix, such as painting it with various substances, are waste of time. It will be noticed that the instances in which cessation of vomiting has followed such treatment have always been about the fourth month, when no doubt cessation would have occurred spontaneously.

It should be mentioned that before abortion is induced in these cases—or in any others—a consultation should be held.

Dyspepsia is not very unusual in pregnancy; and often causes much flatulence. It may occur at any period of the nine months, and is treated on ordinary principles. In cases of flatulence alone, some drug which checks fermentation, such as sulpho-carbolate of soda, taken about three-quarters of an hour to an hour after meals, is very often useful.

The action of the bowels should always be carefully looked after, and any constipation treated.

Salivation is an uncommon disorder. It is sometimes associated with swelling and tenderness of the parotid and submaxillary glands; and in a very large proportion of cases, with vomiting. It often appears at the time at which vomiting in pregnancy is common. The quantity secreted may be so large that a quart or more may dribble away daily in addition to what is swallowed.

Astringents have been tried with success, especially belladonna. Chlorate of potash is recommended. Pilocarpine has arrested the salivation occasionally, and potassium bromide has had the same effect.

Gingivitis is not altogether so uncommon as might be supposed, and it occurs frequently in pregnant women of the lower classes, who do not pay much attention to cleanliness of their mouth and teeth. Care in these particulars, and alkaline and astringent applications are all that is necessary for this mild disorder.

Acute Atrophy of Liver.—This disease has been found in a very small proportion of cases of pregnant women (1-10,000 about). Of all cases of its occurrence 1-4 have been in pregnant women. This may have some connection with the parenchymatous change ('cloudy swelling') in some glandular organs produced by pregnancy.

It is of importance, as pointed out by Matthews Duncan, to remember the possibility of this condition being at the bottom of some cases of pernicious vomiting. Its causes are unknown, but it is believed to be due to a bacillus.

Its symptoms and progress are not modified by pregnancy, and the usual slight jaundice, fever, albuminuria, and cerebral symptoms are present. Leucin and tyrosin crystals in the urine are the most distinctive signs.

The fœtus usually dies; but abortion does not at once ensue, and when expelled the uterine contents have in some cases been found to be macerated.

The *treatment* is to induce labour immediately the disease is diagnosed, in the hope of arresting the degenerative process.

Urinary System

Albuminuria. See page 504.

Bladder Troubles, frequency of micturition, difficulty of micturition, retention, cystitis, are nearly all due to distortions of the vagina, or pressure on the bladder or urethra, by the displaced uterus. Diabetes and polyuria will be dealt with later. The slight incontinence which occurs sometimes has been mentioned in the chapter on Normal Pregnancy.

Respiratory System

The vital capacity of the lungs has been stated by some authors (Wintrich, Kuchenmeister) to be unaltered, while others (Dohrn) have found it diminished in a large percentage.

However this may be, pregnant women are towards the latter end of their term liable to attacks of embarrassment of respiration. This is no doubt induced partly by the hydræmia always present, and partly by the impeded action of the diaphragm; though this latter factor is compensated for to a large extent by the increase in breadth of the base of the thorax.

CHAPTER XLII

ACCIDENTAL COMPLICATIONS OF PREGNANCY

A.—Generative Organs

Metritis.—As a separate disease, this is probably never recognised during pregnancy. It may, however, occur in conjunction with inflammation of the decidual endometrium (p. 246) or of the peritoneum in the layers of muscle near to the surfaces; or it may be part of a septic condition occurring shortly before delivery.

Perimetritis is found in connection with ectopic gestation (p. 313); but under ordinary circumstances, since women affected with this disease are usually sterile, it can only be freshly produced by injury or some cause acting on the general peritoneum, such as tubercle or cancer. Adhesions, the results of previous inflammation, may, if they bind the uterus down posteriorly, cause and maintain retroversion of the gravid uterus, which may become impacted in consequence. In other situations, anteriorly or laterally, they seem to readily stretch, sharing in the general relaxation of the pelvic tissues. It is possible, though not as yet shown, that the pains from which pregnant women sometimes suffer, and which can be referred to definite spots in the uterus, may be due to stretched adhesions. The only

treatment for the tenderness and pain, other possible causes than perimetritis having been eliminated, is to apply local anodynes, such as hot fomentations, stimulating liniments, or iodine.

Parametritis.—This is almost as rare in a recent form as perimetritis. Spiegelberg mentions cases due to injury or effusion of blood (hæmatoma) where suppuration occurred.

The treatment is to be conducted on ordinary principles.

Cervical Catarrh.—Excess of secretion, owing to cervical catarrh, which in most, if not all, cases has probably existed in a lesser degree before pregnancy, is not uncommon. It sometimes causes pruritus vulvæ. On its way through the vagina, the secretion may cause vaginitis, with rarely the formation of small vesicles or pustules.

A pregnant woman may be infected with gonorrhœa, which is sometimes, owing to the venous stasis, severe in its inflammatory results.

In all these cases, gentle vaginal douching with some astringent antiseptic is necessary. This is not likely to induce uterine contractions unless too vigorously done ; but still, in cases when there is a known tendency to abort, it must be very cautiously employed.

Mucous Polypi of Cervix.—In case a polypus of this kind is discovered —attention having been drawn to the cervix by profuse leucorrhœa, or slight hæmorrhage—the best treatment is to remove it at once, since its presence is more likely to lead to abortion than is the operation for its removal. It should be twisted off with a pair of forceps. Very often, however, sterility is caused by these small growths.

Fibroids (myomata).—Fibroid tumours, if submucous, usually prevent conception, owing to the changes which occur in the endometrium in consequence of their presence, and the same may be said of interstitial ones ; but subperitoneal fibroids have little or no effect in this way. Hofmeier has, however, shown[1] that conception very frequently occurs even when large interstitial fibroids are present.

Fibroids as a rule grow during pregnancy, and sometimes out of all proportion to the developing uterus. If they are in the body, they rise out of the pelvis with the growing organ ; if in the cervix, or in the body very near it, a rare situation, they remain below the brim, and when they are of sufficient size to diminish the canal, are very awkward obstacles in the course of labour.

They may interfere with the growth of that part of the uterine wall in which they occur and cause distortion, leading to premature labour. They may induce this or abortion by causing decidual hæmorrhages, and more especially is this likely if the placenta is situated over the tumour, as the former is very likely to overgrow the latter ; or the myoma may set up irregular contractions (see Accidental Hæmorrhage). By enlarging the uterine cavity it is possible that they may lead to the placenta being prævia, the ovum having dropped down to the lower segment before it found a nidus.

[1] *Zeit. für Geb. und Gyn.* xxx. 1894.

Diagnosis.—If the tumour is a fairly large one, and in the pelvis, the diagnosis is arrived at by the same methods as in the non-pregnant woman. The altered anatomical conditions must be remembered, and the softer consistence of fibroids during pregnancy.

The increased mobility of the gravid uterus, and consequently of uterine tumours, unless they fill the pelvis pretty completely, and are fixed by their size, is a marked and important character.

Fibroids of the upper part of the uterus are rather more difficult to recognise than those of the lower segment, for other hardnesses—those of the fœtal parts—are sometimes confusing, and softening and flattening of the surface of the tumour or tumours often occur. In some cases it is possible to make out that during contraction the fibroid tumours become more distinct, but this is not universal. If this can be done in the case of any doubtful tumour, it at once excludes fœtal parts as an explanation of the lump, for palpation of the fœtus is impossible during contraction.[1] Fibroids are sometimes simulated by irregular uterine contractions, which knot up one portion of the uterine wall into a hard mass, and this especially, in the author's experience, during the months at which the fundus is about, or just above, the brim. Careful palpation at intervals of a few days will readily distinguish this condition; and, in fact, it may reveal its true nature at a relaxation-period during a single examination.

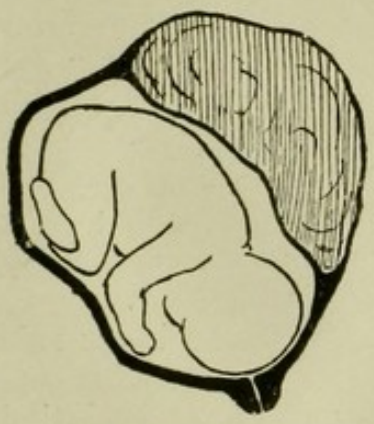

Fig. 253.—Fibroid complicating pregnancy. Uterus relaxed.

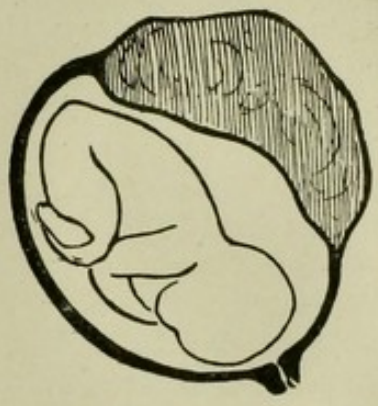

Fig. 254.—Fibroid complicating pregnancy. Uterus contracting.

In a case recently under the writer's care, the woman, who was eight months pregnant, had in her abdomen a two-lobed mass which was the pregnant uterus. The lobes were very much alike in shape and feel. When, however, the uterus contracted, one lobe, which was a fibroid, remained quite evident, but the other lost its prominences, and obviously was caused by the fœtus, whose outlines were then obscured by the contracted uterine wall (figs. 253 and 254).

Treatment.—Treatment during pregnancy is needed only in cases where the tumour, growing from the lower part of the uterus, or in the cervix, occupies and considerably diminishes the pelvic cavity, and then labour may be induced at a time when the child will come through. In severe cases of

[1] See a paper by Braxton Hicks, *Medical Press and Circular*, May 9, 1894, 'On Intermittent Contractions of Uterine Fibromata, and in Pregnancy in Relation to Diagnosis.'

this kind, induction of abortion is indicated. If this is to be done, the sooner the better, as nothing is gained by waiting, and the whole ovum is more readily separated in the early months. If the pregnancy is too far advanced for the ovum to be delivered without some bruising and compression of the mass in the pelvis, it may be better to wait until term is reached, and then to perform Porro's operation (see p. 401), than to extract by embryotomy. Each case will require careful consideration. If pregnancy has occurred with a myoma which has become polypoid, the polypus should be removed by dividing the pedicle with scissors as soon as possible. Conception is very rare with this complication.

Cancer of the Uterus.—The only form of malignant growth of any importance in this connection is *carcinoma of the cervix*. Sarcoma of the uterus is rare at any time; and as it usually occurs in the body, conception is almost impossible. Carcinoma of the body, too, prevents impregnation; and as it never affects women under forty years of age, the co-existence of this disease and pregnancy must be practically unknown. Cancer of the cervix, if not advanced, may be of little hindrance, or of none, to conception.

Of the two varieties of cervical cancer, that of the cervix proper—cylindrical carcinoma—is probably the more marked in its effects, since it invades the cellular tissue around the cervix very soon.

Cancer of the portio vaginalis—epithelioma—tends to spread almost exclusively over the vaginal surface, and does not therefore prevent in such an extreme degree dilatation of the birth-canal. Pregnancy has a very stimulating effect on the growth of cancer of the cervix, owing to the increased activity of nutrition which is thus established. It has, it is true, been held by some that pregnancy actually retards the growth, but this is highly improbable. As against this belief, it is undoubted that cancer grows much more slowly after labour has occurred, and in some cases the symptoms have remained in abeyance for several months after delivery.

The cancer seems as a rule to share to some degree in the softening of the cervix which results from pregnancy.

The ovum is affected owing to the anæmia and the cachexia induced by the cancer. Intra-uterine death happens in a fair proportion of cases, and there is a tendency to premature expulsion of the ovum apart from its previous death. It is possible that many early abortions occur, but escape notice by their symptoms, hæmorrhage and pain, being merged into those of the cancer.

The results during labour will be considered in one of the chapters on the Pathology of Labour (p. 457).

Treatment.—Seeing the tendency to rapid growth during pregnancy, and the proneness of the ovum to premature death and expulsion, there is no doubt that in the early months abortion should be induced. In a very few cases, where the cancer only involves the vaginal portion, and an amputation of this part gives a good chance of extirpating the disease, this part of the cervix might be removed with success; and the pregnancy after the operation has in some such instances gone to term successfully.

As a general rule, the best treatment before the sixth month is to empty the uterus, and then deal with the cancer in the most suitable manner.

In the last three months it is a question whether (1) labour should be induced, and the child extracted (viable, if possible, but if not by some form of embryotomy), the cervix being dilated artificially, preferably by incision; or whether (2) the patient should be allowed to go to term, and Cæsarian section be performed.

The former method gives a somewhat longer life to the mother at the expense of the child's possible or certain death, as the case may be; while the latter may involve shortening the mother's life considerably for the chance of obtaining a living child.

The general tendency will be towards sacrificing the child for the sake of prolonging the mother's life. The choice between the two alternatives, however, is one that may fairly be left to the woman and her husband. If the latter alternative be chosen, palliative measures (antiseptic injections, morphia) should in the meantime be adopted.

The question of Craniotomy, Cæsarian section, and other operative measures will be again alluded to, and discussed more fully, under the Pathology of Labour.

Cancer of the Vagina.—The same principles of treatment will apply in cases of vaginal cancer. If it is so extensive as to form masses which will cause complete, or nearly complete, obstruction at term, or if the vaginal walls are so infiltrated as to be undilatable, labour or abortion will have to be induced according to circumstances (see Induction, p. 362).

Where projecting or polypoid masses can be removed, or cancerous tissue scraped away, this should be done, if there is likely to be sufficient room or dilatability to allow the woman to bear a viable child, and if the cancer does not appear to be growing rapidly. All such cases must be treated on their merits, and the fact borne in mind that the cachexia induced by the cancer is presumably as likely to cause premature expulsion of the ovum as in the cases of cancer of the cervix.

Ovarian Tumours.—Tumours of the ovary do not prevent conception unless the whole cortical substance of both ovaries is destroyed. Consequently the combination of ovarian cyst (cystic adenoma), which is the commonest form of tumour affecting these organs, with pregnancy, is not very rare.

The influence of the tumour on gestation depends on its size, solidity, fixation, and situation. A small ovarian cyst, say the size of a fœtal head, if it rises above the brim with the uterus, affects pregnancy in no way whatever, nor may one of considerably larger size, if quite free in the abdomen. If the tumour is so large that the abdomen is unable to contain it with the gravid uterus, abortion will ensue, being preceded often by exaggerations of those troubles of pregnancy arising from mechanical causes, namely, venous obstruction and digestive and respiratory disturbances. If the tumour is fixed in the pelvis by adhesions, it will then, although not so large as a fœtal head, interfere with the upward growth of the pregnant womb, and cause incarceration or displacements and produce abortion.

The effect of pregnancy on ovarian tumours, whatever their nature, is as a rule to make them grow more rapidly.

It may lead to one accident which occasionally happens to cysts—namely, twisting of the pedicle, hæmorrhage into the cyst, and rupture. The mutual effects during labour and after, of the tumour and pregnancy, will be discussed under 'Labour.'

Diagnosis.—In the case of a fully distended abdomen with signs of pregnancy it may be one of the most difficult tasks to diagnose an ovarian cyst complicating gestation; or, on the other hand, just as in the case of fibroids, it may be very easy, and this is likely to be so if the tumour is small and well defined, and everything is freely movable in the abdominal and pelvic cavities.

Since signs of pregnancy exist in these cases, and will not have existed long enough to correspond to the size of the tumour, the cyst will have to be diagnosed from hydramnios, from hydatid mole, and from twins, as conditions which distend the uterus unduly If the uterus can be differentiated by palpation and bimanual examination from another tumour which is present, there is often no difficulty in obtaining a correct view of the case. If, however, the tumour, say a cystic one, has a very short pedicle, or is fixed by adhesions to the uterus, even examination under an anæsthetic will frequently not be complete enough to clear up the matter. Such an examination should always be made in cases of doubt. The most valuable sign by which to distinguish an ovarian cyst from intra-uterine pregnancy of any kind lies in the *periodical contractions* of the uterus. These may be elicited by gentle handling or compression. In ovarian tumours there is no such sign to be made out; and in cases where cyst and pregnancy are clearly co-existent, the uterus and cyst may in favourable circumstances be accurately distinguished from one another.

Examination per rectum often supplies valuable evidence, and should not be omitted.

Tapping is quite inadmissible, not only for purposes of diagnosis, but practically for any other purpose.[1]

Treatment.—It is now pretty universally accepted that the sooner an ovarian tumour is operated on after it is diagnosed the better. Pregnancy causes no modification of this rule, for although the prognosis of the operation is slightly less favourable when the presence of a tumour is complicated by pregnancy than it is in an unimpregnated woman, it is better than when a patient is allowed to go to term, on account of the risks already mentioned, or than when abortion or premature labour is induced.

Tapping the tumour with a view of tiding over labour and operating afterwards is a mistake, since if it be a cyst, in which case only would tapping be of any use, it soon refills and the operation has to be repeated.

Ovariotomy, on double as well as single ovarian tumour, has now been frequently done during pregnancy, and is an established operation.

The women do very well as a rule, and abortion is not very common

[1] The reasons why tapping should never be performed are: there is danger of puncturing a large vessel; of infecting the peritoneum if the cyst is suppurating, or if it is papillomatous, or cancerous. The fluid may be too thick to run through the trocar or aspirating-needle; it may give altogether erroneous evidence of the nature of the cyst. Tapping also causes adhesions, which will render the inevitable operation afterwards much more difficult. An exploratory operation is better, and should be the only one entertained.

after the operation. It is more likely if there have been many uterine adhesions.

For the effect of ovarian cysts on labour see p. 460.

Malformations of the Uterus.—If the lower parts of the Müllerian ducts, by the union of which the uterus and vagina are formed, do not unite at all, or do so in an incomplete manner, the several varieties of double uterus, or double uterus and vagina, are produced. If the median septum remaining after their union does not disappear, the genital tract from fundus uteri to vaginal orifice may be divided into two halves to a degree according to the extent of persisting septum.

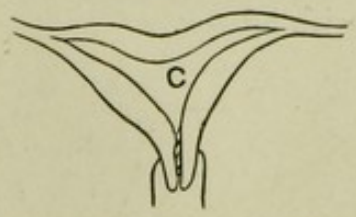

Fig. 255.—Uterus arcuatus.

As the lower ends of Müller's ducts unite first, and fusion proceeds in an upward direction, the commonest abnormalities of the kind above alluded to occur about the higher levels of the utero-vaginal tract.

One of the component ducts may be ill-developed, and then some form of one-horned uterus is produced.

The example of deformity which is the commonest but has the least influence in causing abnormalities in pregnancy and labour is that one

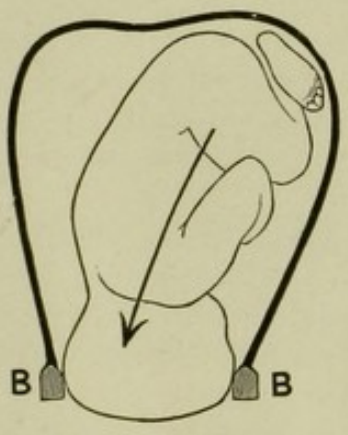

Fig. 256.—Effect of cordate uterus on fœtal axis-pressure, tending to produce a vertex presentation; *B*, brim of pelvis.

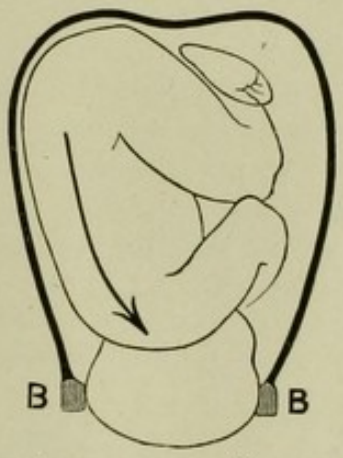

Fig. 257.—Same uterus tending to produce a face presentation; *B*, brim of pelvis.

where the fundus still shows a trace of its development from two halves. This is the uterus arcuatus or cordatus (fig. 255). The deformity is more marked in the uterus sub-septus.

In all three of these uteri the fundus is bi-lobed. There is a depression in, or at all events a flattening of, the fundus as seen from before or behind in the first two.

It is not unlikely that in cases where the fœtus is in the cephalic lie the position of the breech of the child in the lobe corresponding to its ventral (fig. 256) or dorsal (fig. 257) surface may have some influence in producing various presentations (Auvard), by causing the direct uterine pressure (see p. 103) to act downwards obliquely towards the occiput (producing a vertex presentation), or towards the forehead (producing a

brow or face presentation). Otherwise this slight maldevelopment is unimportant. It may be possible to make out the shape of such a uterus during contraction by inspection and external palpation (see fig. 52).

Sometimes a median septum remains which may extend down to or through or even below the cervix. In the latter case it will divide the vagina into two halves (double uterus, double vagina ; uterus septus, vagina septa). In this case there is no interference with pregnancy, and in most cases none with labour.

Fig. 258.—Uterus septus ; *C*, uterine cavity.

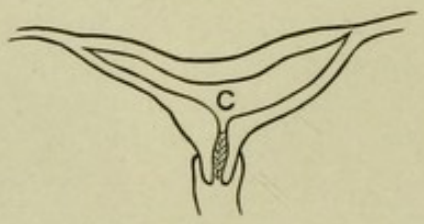

Fig. 259.—Uterus bicornutus ; *C*, uterine cavity.

In a few recorded instances of this malformation the placenta has been found situated on the septum, and severe post-partum hæmorrhage has ensued in consequence of the imperfect retraction to which the septum is subject.

Pregnancy may occur in both divisions simultaneously, or there may possibly be superfœtation (see p. 76). In cases where only one half contains an ovum, the other develops a decidual membrane, which is as a rule expelled at labour. Mistakes have arisen in these cases from an examination made through the wrong cervix.

The uterus may be two-horned (uterus bicornutus) (fig. 259), where the cervix opens into the cavity of both the bodies, which spring from it and diverge as they are traced upwards. The presentation is not infrequently a transverse one.[1] Sometimes the placenta is situated in one horn, and there is difficulty in its expulsion or extraction. During labour, too, owing to the obliquity of the horn containing the fœtus, there may be interference with the normal mechanism, and malpresentations may be brought about.

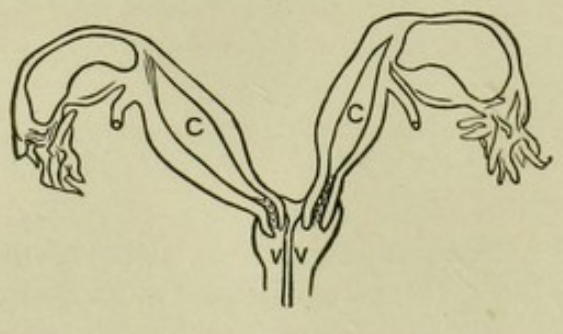

Fig. 260.—Uterus didelphys. *C*, uterine cavity ; *V*, vagina.

In the rare case of the uterus didelphys (fig. 260) the two halves of the uterus are distinct and the vaginæ are separate.

Uterus unicornis.—Here only one half is developed, the other being more or less rudimentary or even absent. If pregnancy occurs in a developed horn it goes on normally, and probably ends in a normal labour. If by any chance, however, an ovum lodges in the rudimentary side the course of

[1] Schatz says 10 in 23.

events is similar to that in tubal gestation, and rupture occurs during the earlier weeks of pregnancy. (See Ectopic Gestation, p. 313.)

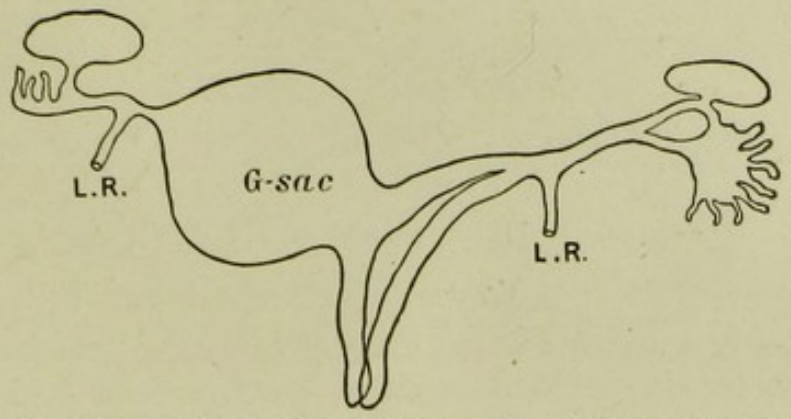

Fig. 261.—Pregnancy in a rudimentary horn of the uterus, showing relation of round ligament (*L R*) to gestation sac (*G* sac).

Clinical signs.—As a rule these are absent, and if the abnormality is discovered at all, it is discovered after labour, sometimes through attention being attracted to a second decidua ; or in the case of pregnancy in a rudimentary horn, after rupture and death.

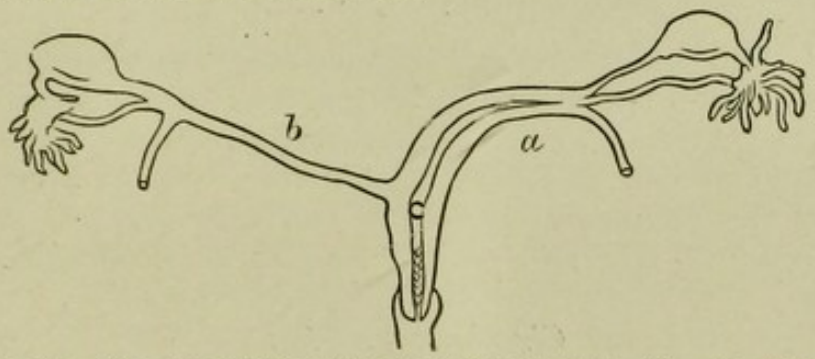

Fig. 262.—The same uterus as fig. 261, unimpregnated. *C*, cavity of uterus. *a*, developed horn. *b*, rudimentary horn.

In uterus bicornis (or bicornutus) the two halves may be made out during the uterine contractions. They do not always contract simultaneously.

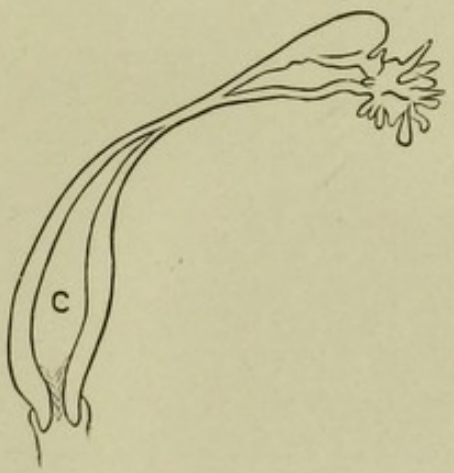

Fig. 263.—Complete absence of one horn. *C*, uterine cavity.

Treatment.—No special treatment is required except for the accident of post-partum hæmorrhage during labour or for rupture, or in cases of malpresentation.

CHAPTER XLIII

ACCIDENTAL COMPLICATIONS OF PREGNANCY—*continued*

B.—Other than Generative Organs

Nervous System

Hysteria.—This disorder shows itself in many ways during pregnancy. In women who are afflicted by it under ordinary circumstances, the liability to become hysterical at this time is very marked. In others there is often a tendency to some manifestation or other of it which becomes more marked at the time of labour.

It is sometimes difficult to say where hysteria ends and insanity begins. The diagnosis and treatment rest on ordinary principles.

Insanity.—See 'Puerperal Insanity' (p. 556).

Epilepsy.—True epilepsy may, of course, occur during pregnancy. The frequency of the fits is sometimes increased, sometimes diminished, and in very rare cases, according to Spiegelberg, pregnancy may be the period at which the first fit occurs. It does not interfere with the pregnancy, thus differing from the eclampsia connected with albuminuria. It has to be diagnosed from this last, and derives its greatest importance from their similarity.

Circulatory System

Heart Disease.—This is an important complication, partly because it is a fairly frequent one, and partly because of the grave effects produced by certain varieties of heart disease on pregnancy and labour. (See also p. 502.)

During pregnancy, owing to the increased arterial tension, incompetence of the *aortic valves* has its already existing effects accentuated; and the compensatory hypertrophy of the left ventricle, if sufficient to carry on the work before pregnancy, is so no longer, unless under the conditions of a very quiet life. Any efforts will tend to bring on attacks of dyspnœa and syncope, and these may lead to abortion. This result is probably not frequent.

In some mild cases patients seem to improve during pregnancy, owing, no doubt, to the hypertrophy of the heart natural to this period.

Mitral incompetence, if not marked, is not a serious complication of pregnancy—at all events, until the diaphragm becomes embarrassed in its action by the uterus in the last months, and then not necessarily to any alarming degree. If, however, the pulmonary circulation is already embarrassed, all the symptoms of backward pressure—dropsy, albuminuria—in addition to respiratory troubles, become very severe, and abortion or premature labour will probably occur.

In *mitral stenosis* the same results may be expected. The most marked influence of this most dangerous form of heart disease is shown during and after labour.

Treatment.—This will be conducted on ordinary principles. In the case of aortic incompetence, complete rest and free purging at intervals are the best measures to adopt, so as to keep the arterial pressure fairly low. In mitral incompetence digitalis is as useful as at other times, and venesection must be employed when necessary.

If the patient's condition in any form of heart disease becomes grave enough to render induction of labour necessary, this should never be done while the heart is considerably embarrassed; but the patient should by every means possible be got into fair condition before the increased work which labour throws upon the heart has to be undertaken, or the effect of such interference may be to bring about a fatal result.

Exophthalmos. Exophthalmic Goître.

If either or both of these conditions are already present, they are as a rule much accentuated by pregnancy.

The increase in size of the gland, and the projection of the eyeballs, subside after delivery to their former conditions.

Respiratory System

Phthisis.—Phthisical women are often very fertile.

The effect of pregnancy on a patient already the subject of phthisis is not, judging from the variety of experiences recorded in such cases, a constant one. It was believed in times past that its effect was, as a rule, favourable; but at present the opinion of most authorities is that the health under this combination is deteriorated to an extent dependent on the kind of the phthisis, and on the stage which it has reached. The question is an important one, for, supposing that pregnancy were favourable to the growth of tubercle, it would be right in certain cases, at all events, to induce labour.

If abortion is induced, it is most likely to be prejudicial, for judging from the results of abortion in cases of pneumonia (see below), an acute phthisis would seem to be a contra-indication to the induction of abortion; and in the chronic cases there would be no justification in the statistics at present available for such a procedure.

Near term, if the uterus were interfering with the working-power of a chest with an already very small oxygenating surface of lung, the advisability of inducing labour might be considered, but only on mechanical grounds. The general conclusion, therefore, one would come to is that it would never be justifiable to induce abortion on account of phthisis *per se*, and that premature labour should only be brought about under the above-mentioned circumstances. In addition, since phthisical women are extremely prolific, the earlier operation would have to be performed very frequently to be consistent, and would inevitably in the end do more harm than good. From the child's point of view, too—and this must be considered, for the child of a phthisical mother is in most cases exceedingly well developed, at birth at all events—abortion should be avoided.

Phthisical women should be strongly advised not to marry, as they hand down their tendency to their children, and run risks themselves.

Pneumonia.—If pneumonia, which seems to be a rare disease in pregnant women, occurs early in pregnancy, it is a dangerous complication, and may

cause abortion. If it occur nearer the end of gestation, it is a very dangerous condition, and almost always leads to premature labour, the fœtus dying because of the pyrexia and imperfect blood-aëration.

Abortion, and still more so miscarriage, under these circumstances may be fatal, owing to the increased strain thrown on the already embarrassed heart, and to the likelihood of septic processes occurring afterwards. Double pneumonia has been found almost universally fatal. Septicæmia and sapræmia (see p. 527) are favoured by the high temperature, and by the fact that organisms are already present in the blood, and ready to multiply in the tissues damaged at labour. The treatment is that of pneumonia under ordinary circumstances, and no attempt at interference with the pregnancy is admissible. On the contrary, any methods that may suggest themselves for averting miscarriage should be made use of.

Bronchitis.—The treatment of this disease in pregnancy is that ordinarily employed. Perhaps on account of the child, bleeding may be resorted to if necessary rather earlier than would otherwise be done. The effect on pregnancy of bronchitis will be much the same as that of mitral disease (p. 296).

Digestive System

Under this heading we only have to consider

Simple Jaundice. (Acute Atrophy has been discussed on p. 286.) It is itself a harmless complication. Rarely abortion has occurred, and the fœtus and liquor amnii have been found to be stained yellow. Its main interest is its possible relation to acute atrophy, into which it has been believed in some cases to merge during pregnancy.

Urinary System

(For **Albuminuria** see p. 504.)

Diabetes.—This is a very rare disease in connection with pregnancy. Its effect on this state, when it happens to be a complication, is marked. It may come on during pregnancy, and may exist only then, being absent at other times; and having ceased at the termination of pregnancy, it may recur afterwards, or never reappear; or it may appear for the first time soon after parturition.

A woman already diabetic may become pregnant, and the pregnancy may be unaffected by the disease. It very frequently happens, however, that the child dies after becoming viable, and it is sometimes dropsical. Hydramnios is frequent; sugar has been found in the liquor amnii, and in one recorded case the child had glycosuria. In twenty-two pregnancies occurring in fifteen women, collected and compared by Matthews Duncan in a paper[1] from which the above facts are quoted, four ended fatally after delivery within the puerperal period, death being due to collapse or to coma. The recorded cases are too few for any decided statements to be made as to the probable mutual effects of pregnancy and this disease. This disorder must not be confused with the physiological glycosuria (see p. 222).

[1] *Obst. Trans.* vol. xxiv. 1882.

Diabetes Insipidus. Polyuria.—The condition in which large quantities of urine are passed daily has been noted in a few cases of pregnant women. The amount passed has reached over 300 oz. per diem, and with this was associated in two cases[1] some diminution in the daily excretion of urea.

The polyuria disappeared in a few days after labour in all the cases recorded but one, it which it had existed for many years. In cases where it disappeared after labour it seems to have begun about the fifth or sixth month.

The symptoms resemble those of the milder degrees of Diabetes Mellitus.

Osseous System

Osteo-malacia. Malacosteon.—This disease is extremely rare in Great Britain. It is connected with pregnancy in a marked degree, often appearing first during gestation or the lying-in period, and being aggravated by succeeding pregnancies. It consists in a degeneration of the bones, especially of the pelvic and vertebral bones, and results in the loss of lime-salts and consequent softening. Cases are recorded where during pregnancy the union of fractures has been much delayed, and it is possible that here and in the disease in question the lime-salts are diverted to the nourishment of the fœtus.

Sometimes the disease is arrested and the bones harden again, but for the most part the disease is progressive. Its effect on the pelvis constitutes its greatest interest; it produces a special form of distortion (see p. 449, Malacosteon Pelvis).

Several cases have been reported where Porro's operation has resulted in checking the disease, and acting on this suggestion Hofmeier, Schauta, Fehling, and others have removed the ovaries with some success.

Schauta[2] collected twenty-four cases of osteo-malacia in which removal of the uterus and ovaries by Porro's operation cured the patient in twenty cases and caused improvement in the remainder. The blood has been found much less alkaline than normal in osteo-malacia, and the urine to contain great excess of fatty-acid compounds, while uric acid, nitrates, phosphates, lime, and magnesia were deficient.[3]

The treatment[4] during pregnancy consists in endeavouring to raise the nutrition to the highest degree possible, by cod-liver oil, iron, and other means. If Porro's operation is not performed at the time of labour (see p. 401), it seems to be certainly worth while to try the effect of oophorectomy afterwards.

Specific Fevers

Some of the zymotic diseases seem to have no modifying influence on pregnancy, but most of them tend directly or indirectly to cause abortion or premature labour. The *direct* effect is observed in small-pox, typhoid, and,

[1] Matthews Duncan, *Obst. Trans.* vol. xxix. 1887.
[2] *Wien. Med. Presse*, No. 27, 1890.
[3] See also a paper by Curatulo, *Obst. Trans.* vol. xxxviii. 1896.
[4] Rasch, *Obst. Trans.* vol. xxxv. 1893.

it used to be said, relapsing fever. In these three fevers abortion or premature labour may occur independently of any considerable rise in temperature. The effect of the disease then appears to be exerted mainly by way of the uterus, for the fœtus in cases occurring in the later months is often born alive.

High temperature alone (106° F.) will cause abortion by killing the fœtus, and it is this element in zymotic diseases that renders them liable to be complicated with miscarriage in pregnant women.

The amount of illness leading to starvation of, and other interferences with the fœtus is also, as in cases apart from fever (see Abortion, p. 303), a very important factor.

The effect of the disease on the fœtus apart from high temperature is very marked in one of the specific diseases—namely, syphilis. The lesions caused by syphilis in the fœtus and placenta have already been discussed (see p. 268).

As regards the liability of pregnant women to infection, it is pretty much the same as in the unimpregnated ; and there is no proof that, as was formerly believed in the case of scarlatina for instance, pregnancy has the power of protecting the woman from, or postponing the invasion of, any infectious disease (see Scarlatina in Puerperium, p. 544).

No doubt the chance of abortion with its complications makes the fever a much more dangerous matter in a pregnant than in an unimpregnated woman ; and, as will be seen when puerperal fevers are discussed, new dangers are added to the fever on account of the breaches of surface and the exhaustion induced by labour.

Typhoid Fever. Enterica.—Typhoid is, according to statistics, commoner during the earlier months of pregnancy, and abortion or premature delivery occurs in about 65 per cent. of all cases. Abortion is more frequent in the more severe cases, and here it is also more likely to give rise to a fatal result. In the milder cases, and also when it occurs early in the disease, abortion does not appear to appreciably increase the patient's danger. It does so markedly when the woman is in the later stages of a severe attack of the disease.

Hyperpyrexia exerts its influence in causing abortion in typhoid as in other conditions, and cases where the temperature is persistently high are almost certain to be complicated in this way. This is shown by statistics of cases published by Vinay.[1] He found that abortion occurred in 55 per cent. only where the cold bath was used to bring down the temperature whenever it became dangerous.

Whether this mode of treatment is employed, or some other which causes less shock to the patient, it is obviously important to be on the look-out for much fever, say over 103·5 F., and to take measures to reduce it at once.

He found abortion to be usually preceded by a rigor or a rise of temperature, and hæmorrhage.

Small-pox.—Pregnancy and small-pox have mutually damaging relations. The effect of pregnancy on small-pox is to cause a tendency to the hæmorrhagic form.

[1] *Lyon Médicale*, Dec. 3, 1893.

The effect of small-pox on pregnancy may be considered in its effects on (*a*) the mother, (*b*) the viable fœtus.

In epidemics of small-pox abortions are found to often occur even when there is no sign of the disease in the woman. This absence of maternal infection may be due to vaccination (see a few lines below).

The general tendency is to produce abortion ; in the hæmorrhagic form it has been observed to occur in nearly 60 per cent. ; in one of the milder epidemics in about 25 per cent.

In the severer cases, confluent and hæmorrhagic, a very large majority of women, 90 per cent., have been found to die. In the milder epidemics small-pox is fatal in about 8 per cent.

In the case of a viable fœtus it is rarely born free from signs of the disease. This may be in the pustular stage, or show the characteristic cicatrices ; or the rash may appear within eight or ten days of birth.

Cases have been recorded [1] where an infected child was born of a healthy mother. The child of a woman who has been vaccinated during pregnancy is seldom found to be protected, that is, insusceptible to vaccination. The child of a woman who has variola during pregnancy, if born healthy, is on the other hand always found to be insusceptible for some long period.

Vaccination, however, does appear to have some influence on the fœtus, for it has been noticed [2] that if a woman was successfully vaccinated during pregnancy the fœtus was very rarely affected in utero.

The treatment of the disease is that adopted in unimpregnated women.

From the above facts it is seen that pregnant women should be carefully vaccinated in case of an epidemic, both for their own sake and that of the fœtus ; and that the child should be vaccinated very shortly after birth.

Relapsing Fever.—This is an extremely rare disease. It has been found most recently by Weber [3] to cause abortion (which is often delayed until the relapse) in about 36 per cent. of all cases.

The spirillum has been found in the fœtal blood.

Measles in the adult is more dangerous to pregnant than to other women (Fagge), and they are liable to abortion owing to the severity of the disease. Sometimes the rash has been found on the new-born child.

Typhus Fever.—This does not affect pregnancy as a rule, but sometimes abortion occurs between the tenth and fourteenth days of the disease (Fagge), the mother afterwards doing well.

Malaria. Ague.—The presence of this disease has a certain influence on pregnancy, interrupting it in about 40 per cent. The abortion is due most probably to the pyrexia, but may be caused by the anæmia so constantly accompanying this fever. The fœtus has been born at term or prematurely with an enlarged spleen. Sir Thomas Watson mentions a case where the fœtus was felt by the mother who had a tertian ague (alternate days) to shake

[1] Curschman, *Ziemssen's Handbuch.* [2] *Zeitsch. f. Geb. u. Gyn.* Bd. viii. p. 18.
[3] *Berlin Klin. Woch.* Bd. vii. 1893, p. 22.

on the days on which she was well. Other and more recent observers have recorded similar instances.

Scarlatina is dealt with in the chapters on the Pathology of the Puerperium (p. 544).

Erysipelas.—This disease has no effect on pregnancy, and its only danger is that if it exists at the time of delivery it may attack the genital surfaces when lacerated or bruised at that time, and thus cause septic troubles (p. 542).

Cholera.—There is one change caused by this disease which seems to occur pretty frequently in cases where the patient does not die too rapidly for its development, and that is hæmorrhage into the decidua. From this cause and on account of the blood-change (inspissation, diminished blood-pressure) abortion, if there is time, may occur, but the patient often dies undelivered.

Syphilis.—The modes of infection and special effects on the embryo and fœtus are described on p. 268, and the unsatisfactory state of our knowledge of syphilis of the placenta alluded to on p. 262.

It only remains now to deal summarily with the effect of syphilis on pregnancy in general.

Syphilis, if contracted during pregnancy, is apt to cause somewhat more marked local symptoms at the site of inoculation, owing to the increased venous engorgement and œdema of the genital canal. Its constitutional effects are, however, mild always, and sometimes entirely imperceptible. Partial proof that the mother has been infected exists in the birth of a syphilitic child, and absolute proof in her resistance to subsequent infection by the child. This state of things is expressed in what is known as Colles' law—namely, that a woman who has given birth to a syphilitic child may expose herself to infection by suckling it or otherwise without danger.

Although a few cases have occurred of infection under these circumstances, the truth of the rule may be considered as practically universal.

It must be again mentioned that a child born of a woman infected late in pregnancy may be, as far as can be seen, quite healthy, and may actually have escaped infection, and that in a case of this kind the mother must not be allowed to nurse it (see Rules as to Nursing, p. 232).

In the case of syphilis contracted before pregnancy the woman tends to be sterile, but this is by no means constant, and diseased women may conceive frequently. In such cases those conceptions which occur soonest after infection are most likely to end in early abortions. After some time the poison, even in the absence of treatment, and more rapidly when the woman's nutrition is otherwise good, becomes attenuated, and the ovum is retained for longer and longer periods until a full-term child is born. This child is then subject to a greater or less extent of hereditary syphilis. If the woman still has children the effect of the disease will become less and less marked, and quite healthy offspring may be at last produced. Tending to the same end, the father's syphilis under favourable circumstances will be

vanishing in the same manner as the mother's If it happens that impregnation by a different father occurs, the chance for the child is so much the better.

Treatment.—The effect of this as regards the fœtus is as a rule particularly favourable. Before impregnation both parents should be treated, and afterwards mercurials administered to the mother by the mouth or by inunction during the whole of pregnancy. It is not hopeless, as evidenced by a case of the author's, even when the woman has reached the fourth or fifth month untreated. In this patient miscarriages and dead children had been the only result of conception. She bore on this occasion, having taken ʒiss of liq. hyd. perchlor. three times daily during the last five months of her pregnancy, a quite healthy child, which one month after birth had shown no sign of syphilis.

CHAPTER XLIV

ABORTION AND PREMATURE LABOUR

THE terms Abortion and Premature Labour are really identical in meaning, but it has become the custom to use the word 'Abortion' for cases of premature expulsion of the ovum occurring before the child is viable, meaning up to the end of the seventh month ; and 'Premature Labour' when delivery takes place after then, but before term.

The term 'Miscarriage' is also in common use, and is pretty well synonymous with 'Abortion,' though it is usually applied to such abortions as happen in the later part of the time comprised within the abortion period.

No more rigid definition can be given than this.

It is also modified into 'Missed Abortion,' which although something of a contradiction in terms, readily explains itself (see chapter on Intra-Uterine Death). This phrase is founded on analogy with 'Missed Labour.'

Causation.—Although the two processes of abortion and premature labour differ from one another clinically, a list of causes will in either case include practically the same agents, the only causes not common to both being those which bring about premature labour by over-distension of the uterus (hydramnios, and twins), or by faulty positions of the placenta (placenta prævia).

The most natural classification is into, first, causes primarily fœtal ; second, those primarily maternal. A third group, consisting of those due to the introduction of foreign bodies into the uterus, and those caused by injury to the genital canal, may conveniently be considered apart, although this group includes some cases which strictly belong to (1) or (2).

It will be unnecessary to enter here into the mode of action of each cause, as this is done in every case under its respective heading in other parts of this work.

TABLE OF CAUSES OF ABORTION AND PREMATURE LABOUR

(1) *Primarily Fœtal.*

Affections of Membranes and Cord, and of Fœtal Placenta. (*e.g.* Vesicular Mole, Hydramnios.)

Affections of Fœtus or Embryo. (See chapter on Intra-uterine Death, under Inherent fœtal causes, p. 269.)

(2) *Primarily Maternal.*

Local affections. Decidua. (Hæmorrhages, and Degeneration; and Placenta Prævia.)

Uterus. (New Growths, Incarceration of Retroverted Uterus, Pregnancy in one horn of a double uterus.)

Surrounding organs. (Tumours interfering with growth of uterus, Adhesions.)

General affections. General Diseases of Mother. (Pyrexia; Anæmia, as from Pernicious Vomiting; Starvation; Zymotic Poisons; Lead; Diabetes; Nephritis.)

Reflex causes. (Mental Shocks; Convulsions including Eclampsia, Chorea, Tetany; Operations; Purging.)

Drugs. (Alcohol, in chronic alcoholism; and very doubtfully, Ergot, Savin, and Digitalis.)

(3) *Mechanical.*

Introduction of Foreign Bodies into the Uterus, Injuries to the Vagina (action mainly reflex), Rupture of Membranes.

Most of the causes mentioned bring about expulsion of the ovum by making it a foreign body. They do this either by interposing a layer of blood between the ovum and the uterine wall, or by killing the embryo in the first instance.

Others act directly on the uterus, and make it contract so as to expel the ovum, and these are best exemplified by what are called in the table 'Reflex Causes,' and include also some mechanical causes, and some diseases of the ovum.

Nearly all of these causes are more prone to act at what would have been menstruations if the woman were not pregnant than at any other time; and in some cases threatening occurs at several of these occasions in succession.

Some women abort in many pregnancies in succession, never going to term. This recurrence has given rise to a term 'Habitual Abortion,' which is now fallen into disuse. It was merely a confession of ignorance. The cause of recurrent abortion cannot be habit, as the term implied; it must be one of those enumerated above, which acts constantly. The commonest causes are:—Syphilis; retroversion of the uterus, leading to incarceration; tumours preventing uterine growth; diseases of the endometrium; renal diseases, and possibly obstructive cardiac and pulmonary diseases; alcoholism.

The Expelled Ovum.—When the ovum is expelled early, say within six weeks or two months, it usually comes away entire. It is then not more

closely connected with the endometrium at one point of its circumference than another, as there is as yet no indication of placenta ; its attachments generally are not very firm, and for its size its envelopes are fairly thick.

The decidual membranes may or may not come away attached to the chorion, and the earlier the abortion the less likely are they to do so. Numerous specimens of ova at about the second month are to be seen in museums (see fig. 46). When fresh the outer surface of the mass expelled consists of clot partly entangled among and partly enveloping the chorionic villi. If this clot is removed by floating the ovum in water and gently clearing its surface, the characteristic pale, seaweed-like appearance is seen (see 'Physiology of Pregnancy'). On opening the sac the embryo may or may not be found.

A week or two later the placental area is becoming marked (ninth to tenth week), and the ovum is often ruptured during expulsion. The fœtus will have escaped among the blood-clots, and sometimes (probably if there are adhesions near the lower pole of the ovum) the membranes are turned inside out, the smooth amnion being external and enclosing the chorion and blood-clot. On the amnionic surface the attachment of the cord, with perhaps a shred of the semi-translucent tissue forming the cord, may be seen.

As the age of the ovum increases the embryo becomes more and more frequently found, and, if not altered by disease, will present the characters proper to its period of growth. The placenta is now fully differentiated, and as a rule remains behind the embryo, to be expelled afterwards with the membranes. The decidua usually at this period of pregnancy either remains attached to the uterus and then may cause septic trouble, or it may come away with the membranes.

The disease which has caused the abortion may make the separation still more difficult than usual during the difficult period by causing abnormal adhesions from inflammation, or possibly from partially organised blood-clot. On the other hand, the recent effusion of a layer of blood may make separation and expulsion very easy ; and this last effect is probably the commoner, seeing how many abortions occur (even after the placenta has begun to grow) without any septic results.

Bleeding.—During the separation of the ovum many vessels are ruptured, and blood in varying quantities is lost. Speaking generally, the longer the process of abortion—that is, the firmer the attachment of the chorion or placenta to the maternal structures—the greater is the hæmorrhage. It is practically all maternal blood, and its frequently large amount in proportion to the size of the uterus is due to the fact that retraction is prevented by the presence of the ovum and of clots, which are constantly irritating the uterus and causing contraction followed by relaxation only. Directly all or nearly all its contents are expelled, the uterus retracts and the hæmorrhage ceases.

The uterus, after complete abortion, diminishes considerably in size, the shrinkage being more marked the more advanced the pregnancy. It is found to be much flatter from before backwards than when it contains the ovum. In the latter case the uterus is globular. Its internal surface is fairly smooth, and on it adherent pieces of chorion and decidua, where there are any, may be detected by the examining finger. If sufficiently marked

by this time the placental site may be felt as a slightly convex, roughish surface. Up to the middle of the third month, and perhaps a little later, the whole interior will be smooth if everything has come away.

In a very few hours after complete evacuation, the cervix will probably be found impassable by the finger. If, however, any products of conception are retained, and especially when any hæmorrhage of importance exists, the internal os is nearly always open, or very easily dilatable.

Symptoms and Course.—The two characteristic symptoms of impending or actually occurring abortion are *Pain* and *Hæmorrhage*. The reason for the bleeding has been described ; and it is seen that no abortion in the early months can occur without it, since at every contraction some detachment with rupture of vessels will take place.

When the embryo is of some bulk, and is expelled separately, the process is like that of labour at term, because there is no rupture of vessels of any significance until the fœtus and liquor amnii have been expelled, and the placenta begins to separate.

In the very early weeks an abortion is often mistaken for a delayed menstruation, which the patient is not surprised to find excessive. At this date the hæmorrhage is a more marked symptom than pain. The ovum easily escapes notice among the clots, and has to be carefully looked for.

At the time when the placenta is in process of formation—namely, during the third month—the course of events during expulsion is most characteristic and recognisable.

Bearing-down pains in some degree are always present. The process begins with some of the symptoms of commencing labour. There is often a considerable discharge of mucus, and this more or less rapidly becomes blood-stained, and then merges into almost pure blood. The quantity of blood lost varies very much, depending on the rapidity with which expulsion occurs ; the more steadily and rapidly the ovum is separated from the uterus (meaning, as a rule, the fewer and less resistant the adhesions) the less blood is lost.

Different Phases.—(*a*) *Threatened Abortion.*—Occasionally, after making a beginning in a fairly active manner, the uterus becomes quiet and the detachment and hæmorrhage cease ; and if the bleeding has not been free nor the pains very regular, there is a chance that the attack will pass off and the pregnancy go on to term or until another attempt at abortion is made. While there is this chance of subsidence the abortion is said to be *threatened*.

Threatenings of abortion have been known to subside even when a piece of decidua has been expelled. If this has happened, however, there is practically no hope of saving the ovum.

(*b*) *Inevitable Abortion.*—If, instead of quiescence, steady uterine contractions and free loss of blood go on, the abortion becomes *inevitable*. The abortion is likewise practically inevitable when these symptoms reappear after an interval of quiet ; and if a portion of chorion or (if the ovum is developed sufficiently) the liquor amnii is discharged. The ovum, at all events, dies, and may very exceptionally be retained for a time (Missed Abortion, p. 269).

In the favourable cases the complete separation and expulsion of the ovum and decidua take place in the way already described, and on this completion the hæmorrhage ceases. A kind of lochial discharge often goes on for a day or two after, and sometimes this consists of nearly pure blood. The quantity lost is, however, very small.

(*c*) *Incomplete Abortion.*—If any of the decidua, or chorion, or placenta when this exists, is left behind, owing to morbid adhesions, the hæmorrhage usually goes on more or less continuously until it is expelled; or decomposition may occur, and septic infection result. Retention is more likely to occur when the ovum has been ruptured, whatever its age may be up to the third month. Sometimes nothing escapes but the liquor amnii and the

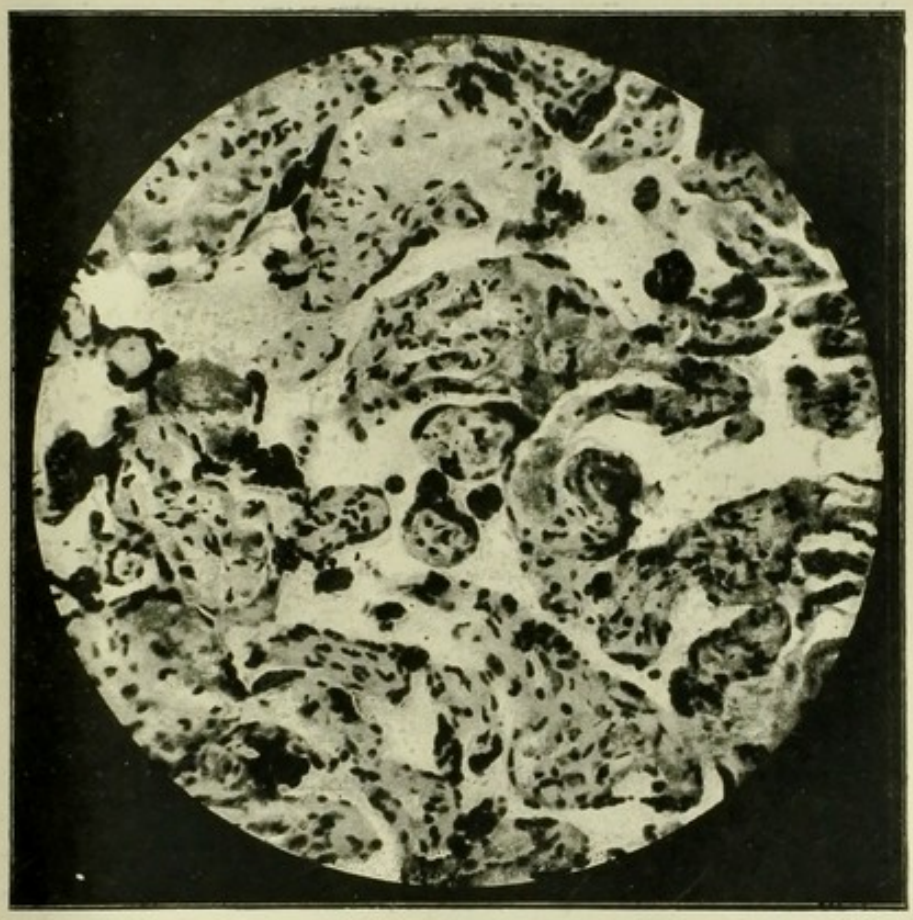

Fig. 264.—Section of a retained piece of placenta, showing villi embedded in clot. (Eden.)

fœtus; and the whole membranes and incipient or partially developed placenta are left behind.

Incomplete abortion does not always at once lead to continuous bleeding or septic changes. Occasionally the uterus becomes quiet and the internal os closes for a longer or shorter period, and all seems well. Sooner or later the retained portion gives evidence of its presence. It may be by menorrhagia of a severe type, or metrorrhagia. In some of these cases, where there is no reliable history of a previous abortion, the true diagnosis of the case is not arrived at until the uterus has been dilated and its contents examined.

Even when the whole placenta is retained the uterus may make no effort

to expel it for weeks or even months ; and this happens almost always in cases where very little or no detachment of the placenta has taken place, and the organ is able to keep up its vitality by means of its normal or abnormal vascular connections to the uterus.

When a small portion of placenta is retained, fibrin often deposits on and in it, and forms what is known as a *placental polypus.* This causes much the same symptoms, though they, as a rule, occur later, as an incomplete abortion, and may be considered as such. The placental site, in the absence of adherent structures, may be rough enough for such a polypus to form upon it. Decomposition of retained portions of the ovum is likely to occur, if by any means septic or putrefactive organisms have obtained

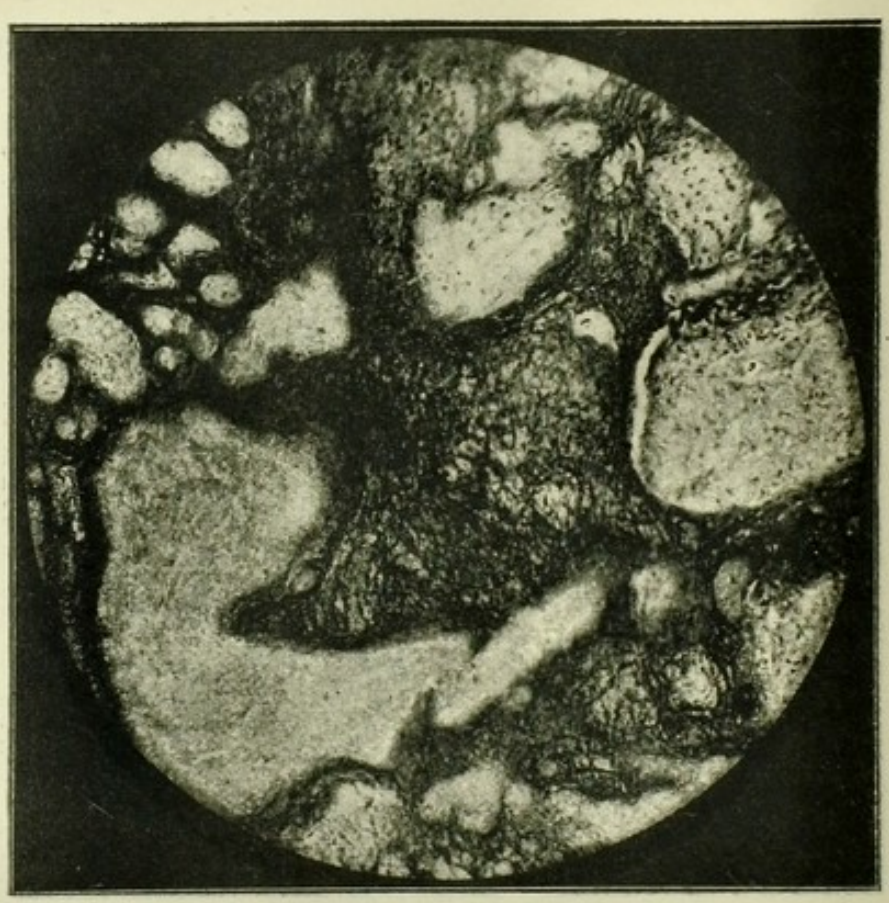

Fig. 265.—Section of a retained piece of placenta, showing villi (pale) with old and retracted blood-clot between (dark). There is no connective-tissue formation in the clot. (Eden.)

entrance into the uterus during abortion. Such contamination is due to the introduction of dirty fingers or instruments, or to extension from the vagina.

The results may be mild or severe, and may occasion any of the local or general forms of puerperal septicæmia which are possible after labour at term.

As a rule the milder forms occur, owing to the uterine sinuses being smaller and fewer than at term, and to the absence of lacerations and abrasions of the genital tract caused by the passage of a full-grown child.

After abortion, the uterus is as a rule found to be flatter than before, and this character of shape is a more valuable sign of the state of affairs when there is a doubt as to whether abortion has threatened or has actually

occurred, than the actual size of the organ, unless the period of pregnancy at which abortion occurred is exactly known.

Involution takes place pretty rapidly if the process is complete, and the patient in good health ; and milk often appears in the breasts for a very short time. Abortion is, however, a very fertile cause of subinvolution.

Complications and Sequelæ.—Abortion, more frequently than delivery at term, leads to uterine trouble, acute or chronic.

Owing to the affection of the membranes which causes it, the ovum may during time be abnormally adherent, and thus be imperfectly expelled.

In the second place the cause of the abortion may remain, and may be a general or a local condition.

In the third place, abortions are frequently considered as a matter of little importance, and they are improperly treated during the process and afterwards.

The *complications* which may occur comprise (1) Hæmorrhage much more profuse than usual, and sometimes but rarely fatal ; (2) Septic infection, local, as peri- or para-metritis, salpingitis ; or general. The possible *sequelæ* are menorrhagia and metrorrhagia, and with these always subinvolution. This last is caused by one or more of the conditions enumerated above, as leading to ill effects after abortion. Tetanus, though rare in England, is not so uncommon in hot climates, and inversion of the uterus has occurred in a limited number of cases.

Diagnosis.—The first thing to settle is whether the patient is or has been pregnant. This is not difficult in most cases where the question arises of possible pregnancy advanced to the fifth, fourth, or even third months. In cases which can only have reached the second or first month it is often impossible to decide, as the patient will have only missed one period at the most. However, when there is a history of sudden hæmorrhage occurring in a healthy woman, abortion should always be the first thing to be thought of, and in the absence of any physical signs of other causes, such cases must always be treated as if they were abortions. There is no doubt, of course, if portions of chorion with villi are found in the discharge. (See also Ectopic Gestation.)

Expulsion of a membrane, or a substance like membrane, occurs also in cases of pregnant double uterus (p. 294), membranous dysmenorrhœa, and in cases such as those referred to on p. 251. Fragments of old clot and flakes of fibrin are sometimes expelled. The microscope will, as a rule, by showing the presence of villi, settle the matter at once (figs. 264 and 265).

The next point, if the case is considered to be one of abortion, is to decide whether the abortion is *threatened*, *inevitable*, *complete*, or *incomplete*. The symptoms and signs of these various phases have been already considered.

In the case of indications (continued hæmorrhage, signs of septic absorption) pointing to incomplete abortion, the question should be at once settled by dilating the cervix, if this will not admit the finger, and digitally exploring the uterine cavity.

Treatment.—If abortion have occurred in previous pregnancies, the cause should be sought for, and when found, removed if possible. The

cause will be found among the list of those given in connection with recurring abortion, p. 304. The woman should rest much, especially during the days which would have been days of menstruation, avoid all violent exercise, and abstain from intercourse.

Threatened Abortion.—The object here is to arrest the process. A careful examination of the pelvic organs should be made once for all, so as to exclude any possible mechanical causes (retroversion, tumours).

The patient should be kept absolutely at rest in bed, and put on the simplest possible diet. No application to, or interference with, the genital organs, even the external ones, must be permitted.

The uterus should be quieted by small doses of opium, with which, in cases where the hæmorrhage is small in amount and inclined to be continuous, five or ten minims of the Liquid Extract of Ergot may be usefully combined. The effect of this last drug is, in such small doses, to steady the uterus. Digitalis in small doses is recommended by Spiegelberg, or acetate of lead in large doses.

If it is necessary to open the bowels, mild laxatives, such as Conf. Sennæ or Pulv. Glycyrrhizæ Co., are the safest ; enemata must not be employed. This line of treatment must be persisted in for some days. All clots and substances passed by the woman must be carefully preserved for examination.

Inevitable Abortion.—When it is found that attempts to prevent miscarriage are futile, and that the process is going on in a regular manner, without too much hæmorrhage, it is best not to interfere, but to watch the process and be ready to help in case the bleeding becomes excessive, or the uterus is not completely emptied. (Incomplete abortion.)

If the hæmorrhage becomes dangerously free, some measures must be taken to check it which will at the same time hasten labour, since directly the uterus is empty the bleeding will cease.

The choice of treatment lies between removing the ovum with the finger, assisted or not by instruments, and plugging the vagina or cervix and vagina.

The ovum may at once be removed by the finger, aided or not by a quite blunt curette if the cervix is sufficiently dilated to admit the finger into the uterus. This should be done if the ovum is presenting at the cervix ; or if the membranes have ruptured and are retained with the placenta (if this is formed) ; or if plugging has been resorted to, and has failed to bring about expulsion of the ovum, the cervix being, however, dilated.

The operation is performed as follows :—The vagina and vulva are made aseptic in the manner described on p. 184 ; a catheter is passed, and the rectum emptied if necessary. The forefinger of the right hand, carefully made aseptic, is introduced into the vagina and the uterus is caught bimanually. The forefinger of the internal hand is passed through the cervix, and the uterus is pressed down on to it by the external hand through the abdominal wall. As the uterus is pressed down it comes to lie about in the axis of the cavity of the pelvis, and this is the position which allows of the most complete introduction of the finger. In multiparæ the hand if necessary may be introduced into the vagina under an anæsthetic. The tip of the finger is passed to the fundus and sweeps the contents of the uterus down before it, gently detaching them from the uterine wall. If a hold cannot be obtained

of the substance to be extracted, a wide, blunt curette with a scraping (not a cutting) edge may be carried up on the palmar surface of the finger, and the site of attachment being already made out, the ovum or placenta is gradually detached and brought down. The external hand should be at the corresponding place outside, so as to make counter-pressure. The uterus can thus be cleared out without any damage being done to it. A sharp curette is inadmissible, for the tissues of the uterine walls are softish and may be lacerated.

A weak antiseptic intra-uterine douche (1 in 4,000 solution of perchloride of mercury) should now be given, great care being taken that a free outflow is maintained. This is best insured by the use of Budin's catheter (see p. 228). If the cervix is not sufficiently dilated to admit the finger readily, it may be dilated with Hegar's dilators (see p. 357) up to the necessary size, and the uterus evacuated as just described.

Plugging the Vagina, or Cervix and Vagina.—Either of these methods may be employed if the cervix is still undilated and the bleeding is too free, whether the ovum is still entire or has ruptured. They are, however, not admissible when septic changes have occurred. As regards the relative merits of plugging the vagina alone, or plugging the cervix by a tent which will also actively dilate it, there can be no question that the latter is a more rapid and satisfactory method of completing the process of abortion. For although the cervix, when the uterus is stimulated by a vaginal plug, dilates as a rule, and the ovum or its remains are expelled, this does not always happen, and the dilatation has then to be completed by the use of tents, or by Hegar's or other rapid dilators (see p. 356 for description and mode of using tents).

After the tents have been removed the vagina is douched, and the aseptic finger is passed into the uterus, if sufficient dilatation has been obtained to clear it out as described above.

If the finger cannot be passed, it is far safer to complete the dilatation with Hegar's dilators than to use the tents again, as the risk of sepsis is thus rendered much less.

It not infrequently happens that on the withdrawal of the tent the ovum follows.

If no tents are available, the cervix may be plugged with a strip of antiseptic gauze.

Plugging the Vagina.—The cases in which the vagina alone may be plugged are, as already mentioned, the same as those in which tents may be used. Material for plugging the vagina can always be found. The best substance is iodoform gauze, as it packs into a very solid mass, not altering much in shape when it is soaked through with serum.

Carbolic gauze will do, but is not nearly so pleasant to work with in these cases, or cyanide gauze or any other antiseptic kind may be used. In an emergency strips of linen, previously soaked in an antiseptic solution (1 in 1,000 sublimate, 1 in 20 carbolic acid) and carefully wrung out, or boiled for a few minutes, will answer quite well. The gauze or linen is most convenient when torn into strips 3 to 4 inches wide and 2 to 3 yards in length, and then rolled up ready for use.

The vagina is rendered aseptic, and a Sims' speculum passed, the patient being placed in the semi-prone or in the lithotomy position. The end of the strip is made into a lump the size of a walnut, and passed into the posterior fornix with the fingers. It is held there by the point of a pair of uterine forceps, or by the forefinger of the other hand. The rest of the strip is gradually passed up, filling the fornices tightly, and thus completely surrounding the vaginal portion of the cervix. More of the plug is passed up, until the vaginal canal is filled. The lower end of the vagina must not be tightly packed, or the urethra will be compressed and occluded.

This plug is left in for eight or ten hours, a catheter being used if necessary, and the patient, as in the case of the tent, will remain in bed. At the end of that time it is removed, and a douche given. The ovum may be now found on the plug, or just ready to be removed from the cervix. If not, the latter should be rapidly dilated with Hegar's dilators, and the ovum or its retained portion taken away with the fingers.

Incomplete Abortion.—When, after the embryo or the greater part of the ovum has escaped, the placenta, if it is formed, or portions of the ovum are retained, even if they do not give rise immediately to hæmorrhage, they should be removed from the uterus within twenty-four hours.

After that time they become dangerous, on account of possible decomposition and septic absorption. It has been mentioned that sepsis under these circumstances is not so common after abortion as after term delivery, and the reason for this has been given. There is, however, a sufficient probability of the accident to make the above rule the only good practice.

The best way is to clear out the uterus within an hour after the fœtus has passed, and finish the matter. The mode of doing this has been already described in the case where hæmorrhage renders it necessary. Dilatation of the cervix may or may not be needed. Supposing a case is seen when there is a history pointing to an abortion, and where there are symptoms of retention of something—namely, hæmorrhage and a foul discharge, with a still large and possibly globular uterus. In this case, especially if the hæmorrhage is in progress, the cervix will probably be found dilated enough to allow digital exploration. If not, it must be rapidly dilated with Hegar's dilators, and no tents or plugs used, as they would certainly increase the risk of sepsis.

The finger may find some or all of the placenta, or may only find a shreddy or fungous internal surface. If everything can be removed by the finger, there is no need of any other instrument ; but, even where there is a good-sized piece of tissue, this is often difficult, and a large blunt curette worked by the other hand should be used to oppose the finger introduced into the uterus. The small masses can be readily caught between the curette and finger and drawn out. The curette can then be carefully used to complete the clearing of the surface. The uterus should then be washed out, with the precautions already mentioned, a Budin's catheter being used.

The treatment of cases which come under notice some months after abortion, and where fibrinous polypi are found, is conducted on the same lines. After evacuation has been completed the uterus undergoes involution very rapidly.

If septic absorption has already occurred, there is all the more reason for immediate action of this sort. It is sometimes difficult, however, when there is a mass of parametritis on one side of the uterus, or where perimetritis exists, to judge whether interference is best or not. If the cervix is dilated, the uterus may be very gently curetted with a blunt curette, and washed out; but if it is closed, it is probably safer not to risk causing extension of the inflammatory process into the surrounding tissues by disturbing the uterus. In this case ergot may be given, and the vagina should be frequently douched with an antiseptic solution.

After-treatment of Abortion.—When the uterus is empty, involution goes on with rapidity as a rule. The greatest obstacle to involution, excepting pelvic inflammation, is too early getting up. The woman must be kept in bed for at least a week in any case, and where possible for longer, and treated as if labour at term had occurred. Ergot given in ℥ss doses is recommended as a routine treatment by many, but under ordinary circumstances the course of involution will go on as well without it.

CHAPTER XLV

ECTOPIC GESTATION

Definition.—In this abnormal variety of pregnancy the ovum becomes implanted on some other surface than that of the endometrium of the body of the uterus, and there undergoes more or less complete development. These cases are known also as extra-uterine. 'Ectopic,' however, is the more inclusive term, since in one variety of this abnormality, the interstitial, the ovum is not placed altogether outside the uterus, but in its wall, and lies in the intramural portion of the Fallopian tube.

In no case does the ovum develop in any part of the genital canal below the internal os; and in the cases under consideration the ovum finds a site before it reaches the uterine end of the Fallopian tube; on some spot between the ovary and the uterine cavity.

An ectopic and a normally placed ovum may develop simultaneously.

Causation and Frequency.—Any condition which interrupts the journey of the ovum to the uterus may bring about ectopic gestation. Among such conditions are usually mentioned adhesions of the ends of the tubes to surrounding parts, or other distortions which might cause difficulty to the ovum in reaching and passing the abdominal ostium (see p. 2); and chronic tubal disease, without obliteration of the lumen, but resulting in the loss of the normal ciliated epithelium which helps to carry the ovum along to the uterine orifice.

These are merely probable, and not proved causes; for after the very considerable changes in all the tissues and their anatomical arrangements

which the development of an ovum among them brings about, it is almost impossible to say what the state of things was at the time of conception.

Considering the large number of women who have had perimetritis and adhesions before conception, such causes as these cannot be finally accepted, and some special kind of cause or disease must be proved.

The absence of cilia, owing to inflammatory destruction of the epithelium, sounds a possible explanation of the resting of an ovum in the tube; but the peristaltic contractions of the tubes must also play an important part in the journey of the ovum.

It is believed by some that implantation of an ovum can occur only on a surface from which the covering epithelium has been removed. This removal of epithelium is said to happen in health in the case of the endometrium of the uterine body only. Decidual changes, which are no doubt necessary for implantation, have been found, however, in some cases of tubal gestation, in the non-pregnant tube (Webster). This suggests that such changes may sometimes occur in the tubes on conception taking place, as well as in the uterus. If in such a case the ovum is fertilised high up in the tube, and some distortion of the tube interferes with the free continuity of its lumen, the ovum will find a spot suitable for its implantation in the tube so altered.

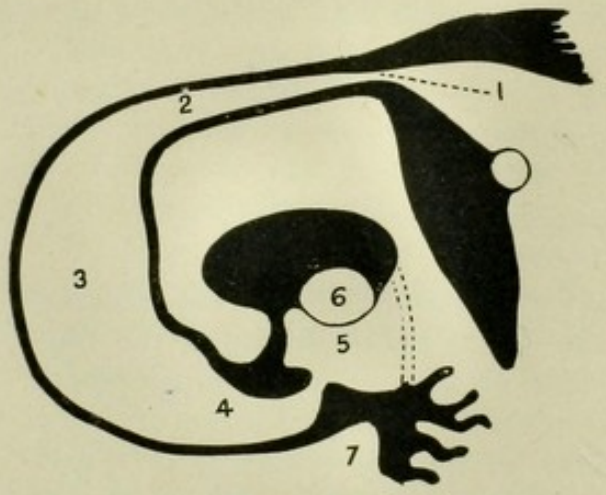

Fig. 266.—Sites which ovum is capable of occupying. 6 is unproved as yet.[1]

Women who are the subject of ectopic gestation are more commonly than not middle-aged, from 28 to 40; and, being married, have been sterile for some years, either after one or more pregnancies, or from the beginning of married life. This fact supports in some measure the view that obstruction is a factor, as such women are possibly sterile on account of some anatomical change.

There must of course be room enough for spermatozoa to pass along the tube so as to reach the ovum, and it is assumed that fertilisation may occur in the tube under ordinary circumstances. Ectopic gestation occurs no doubt in a far larger number of cases than can be proved; and it has been found of late years with infinitely greater frequency than formerly. It is now believed that practically all large intra-peritoneal hæmatoceles have their origin in the rupture of a tubal gestation.

Varieties.—These include, according to the most recent views, tubal cases only, with sub-varieties developed from them.

The following classification, founded on our present knowledge, is taken from Webster.[2]

[1] According to old ideas, the ovum might become implanted in any one of the situations marked in the diagram.

[2] Ectopic Gestation.

1. *Ampullar*, in which the gestation begins in the ampulla of the tube. This is by far the most common origin. (3, fig. 266.)

i. Persistent. In rare instances the tubal gestation may go on to full term.

ii. Rupture may take place early into the broad ligament,—sub-peritoneo-pelvic, tubo-ligamentous, extra-peritoneal, broad ligament gestation.

(*a*) The gestation may continue to develop,—sub-peritoneo-abdominal.

(*b*) A secondary rupture of the sub-peritoneo-pelvic gestation may take place into the peritoneal cavity.

(*c*) The gestation may come to an end ;

(i) by the formation of a hæmatoma.

(ii) by suppuration.

(iii) by mummification, adipocere, or lithopædion formation.

iii. Rupture may take place into the peritoneal cavity.

(*a*) Tubo-peritoneal gestation, in which escape of the fœtus in the membranes occurs into the peritoneal cavity, the placenta remaining in the tube and its development continuing.

(*b*) The gestation terminates in various ways :—

By the formation of a hæmatocele, the patient dying from the shock and loss of blood, or from peritonitis. In some cases the absorption of the mass may occur. In others, mummification, adipocere, or lithopædion formation may take place in the fœtus, or suppuration may result.

iv. The gestation may be destroyed—

(*a*) by the formation of a tubal abortion, and its passage through the fimbriated end of the tube into the peritoneal cavity.

(*b*) by the formation of a hæmato-salpinx.

(*c*) by the formation of a mole.

(*d*) by suppuration resulting in a pyo-salpinx.

(*e*) by absorption after early death, by mummification, adipocere, or lithopædion formation.

2. *Interstitial.*—The gestation may develop in the interstitial part of the tube (1, fig. 266) :—

(*a*) The gestation may go on to full time.

(*b*) Rupture of the gestation into the peritoneal cavity may occur.

(*c*) Rupture into the uterine cavity may occur.

(*d*) Rupture into both the uterine and peritoneal cavities may occur.

(*e*) Rupture may occur between the layers of the broad ligament.

(*f*) After the death of the fœtus it may remain in its sac, and possibly undergo the same changes as in other forms—*e.g.* mummification, adipocere, or lithopædion formation.

3. *Infundibular.*—The gestation begins in the outer end of the tube, or in an accessory tube-ending (4 and 5, fig. 266). Under this heading are to be included the forms described as tubo-ovarian and tubo-abdominal—names which appear to be unnecessary, since the gestation is a tubular one in origin, the end of the gestation-sac merely becoming adherent to the abdominal wall, the ovary, or other of the viscera.

Anatomy and Development.—It is thus seen that an ovum may become implanted at any point in the length of the tube. The commonest place is in the ampulla, and in the middle of the length of the tube; but in the rare interstitial variety the ovum lies at the uterine end, and in the infundibular it lies in or near the ostium abdominale. These sub-varieties resemble one another in the fact that the ovum can, as a rule, grow only to a limited extent before a crisis occurs, but differ in the fact that in the interstitial kind the ovum may possibly be expelled[1] into the cavity of the uterus with symptoms resembling those of abortion. In the other two kinds various results occur, as shown in the tables.

Ampullary Form.—As the tube enlarges, its relation to surrounding parts becomes modified, modifying in its turn the whole anatomy of the

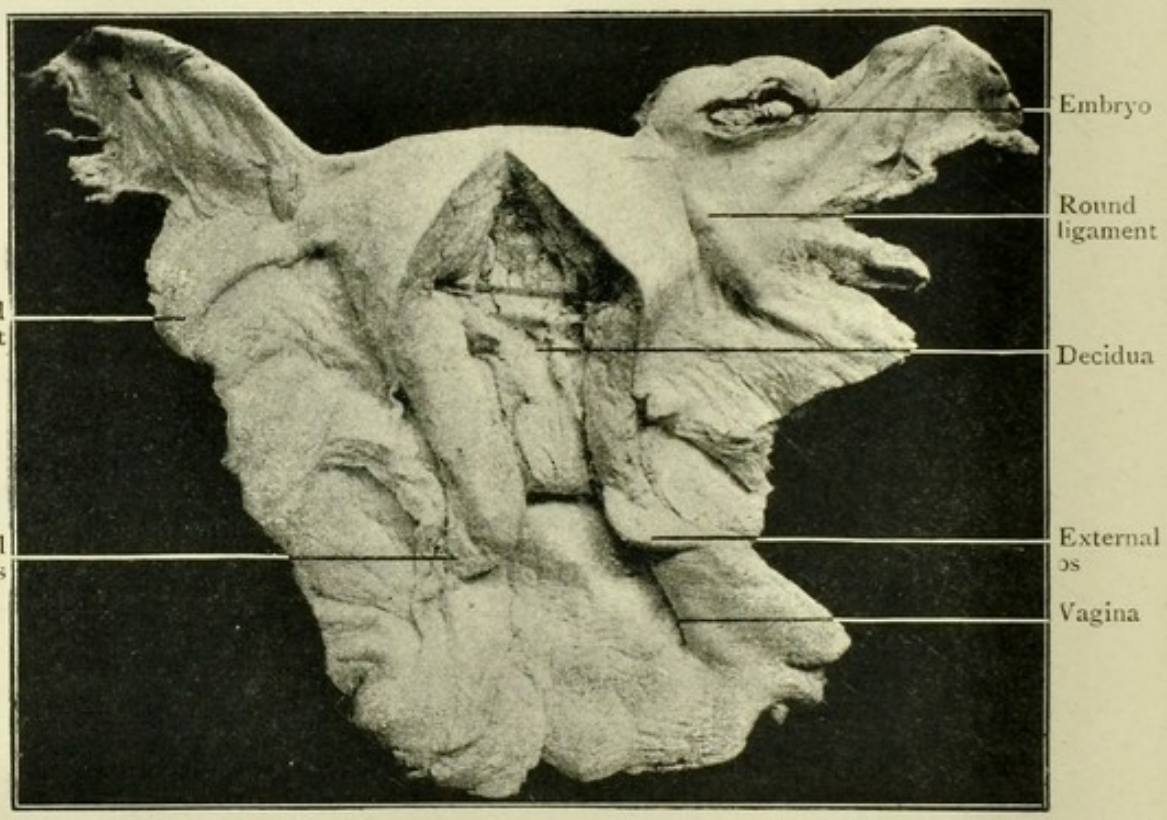

Fig. 267.—Uterus (enlarged, with decidua) and a gravid tube, the left. The embryo is seen to lie at the junction of the isthmus and ampulla. (St. George's Hospital Museum.)

pelvis, and the abdomen if it extends into that cavity. The tube is, until fixed by peritonitis, movable within certain limits. Its increased weight causes it to fall below its normal level, and it may be found at almost any part of the pelvic floor or in Douglas's pouch. As it grows it pushes the uterus to one side. It may be closely adherent to the uterus, or only attached by its proximal end, forming a distinct mass. The ovary may form part of the sac or be quite distinct.

Webster describes the development of the decidua into a compact and a spongy layer, as in intra-uterine gestation. That area of the decidua which is to form the maternal placenta, and corresponds to the serotina, grows more rapidly than that in the rest of the tube, and occupies proportionately a larger

[1] Grün's case, *Obst. Trans.* 1885.

surface than is the case in the uterus. A decidua reflexa has been found in early specimens ; it appears to degenerate rapidly, and to give rise to hæmorrhages early in the pregnancy ; being, according to Webster, probably the main source of the blood found in that part of the tube outside the gestation.

The *placenta* seems to be formed in the same way as in the case of intra-uterine gestation, and sinuses are developed in the decidua. The same proliferative change occurs in their endothelium as is found in the sinuses and vessels of the normally-seated organ (see p. 26) ; but it would appear to take place at an earlier date, and in fact can only be recognised in the early months. Hæmorrhages and their remains are very frequent in the placenta in these cases, and will account for the belief of some authors in the possibility of growth of the placenta after death of the fœtus. The hæmorrhages sometimes convert the placenta into a more or less spherical liver-like mass.[1]

The muscular coat of the tube thickens (? hypertrophies) for about two months (Hennig), with considerable enlargement of the nuclei in its muscle-cells, and then it thins. The abdominal ostium becomes closed.[2] The cyst usually grows mainly towards the free aspect of the tube, but sometimes protrudes between and separates the layers of the broad ligament. Death of the ovum may occur at a very early period, and in that case nothing is found but a clot, forming a small blood-mole in the tube, which may be extruded from the ostium abdominale (see tubal abortion, p. 322), bleeding being the usual accompaniment or the cause of the death of the embryo. In this case the symptoms and signs of gestation cease, and the small mole seems to cause no trouble.

The ovum, as a rule, continues to grow, and in two-thirds of the cases of the ampullary kind rupture occurs before the end of the second month ; in somewhat less than the remaining one-third in the third month ; and it may happen as late as the fourth month. In one or two cases the pregnancy has reached the sixth month without rupture, and has even gone to term.

The cause of the rupture is no doubt the thinning of the tube, and the crisis is brought about, at all events in many cases judging from specimens, by a hæmorrhage, probably maternal but in some cases appearing to be from the ovum, which suddenly distends the tube beyond its power of resistance.

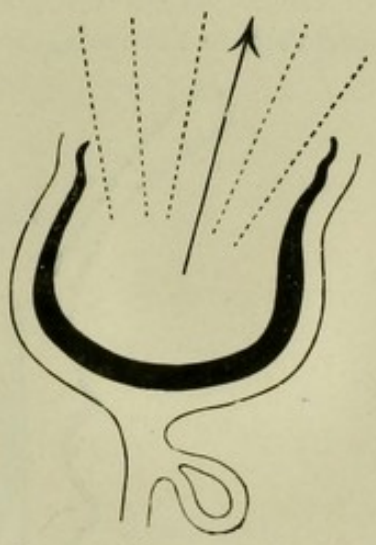

Fig. 268. – Rupture of the tube into the peritoneal cavity.

Rupture probably occurs oftenest into the peritoneal cavity (fig. 268), and this may happen simultaneously with rupture into the broad ligament. When rupture takes place there is nearly always a large effusion of blood, which may be so copious as to kill the woman in a few hours. In very early rupture the loss is often only of moderate quantity, but may be repeated on two or three occasions, with an eventually fatal issue. During the intervals between the hæmorrhages, the symptoms of which will be described later,

[1] John Williams, *Obst. Trans.* vol. xxix. p. 482.

[2] See Sutton's *Surgical Diseases of Ovaries and Tubes*, pp. 311, 312, and 314.

the sac must be supposed to increase in size, most probably by gradual accretion of blood and lymph to its mass. If the woman survive, as, if the loss is not too large at first, she sometimes does, a pelvic hæmatocele is produced. If the mother recovers the embryo dies, and is absorbed at this age in most cases. Sometimes, according to recent observations, rupture at this stage may produce what used to be called 'abdominal' pregnancy, the embryo retaining some attachment to its original site in the tube and continuing to grow, being free from its envelope of chorion if this has ruptured, or, if not, lying in it ; and a cyst is formed round the embryo by peritoneal exudation.

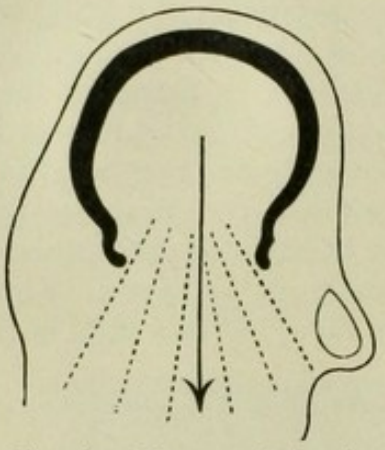

Fig. 269.—Rupture of the tube into the broad ligament.

In other cases, instead of the tear being on the peritoneal surface of the tube, it may be (about one-third of the cases) on that segment of its cross-section which lies between the layers of the broad ligament (fig. 269). Rupture in such cases is usually in the middle third in length.[1] Blood is thus effused into the ligament, the two layers of which stretch to a limited extent, and then as a rule are sufficiently strong to maintain enough tension to check the bleeding, and to prevent immediate rupture into the peritoneal cavity. There is now produced a hæmatoma of the broad ligament, and in this the embryo may be alive or dead. If alive it goes on growing, the placental site being sufficiently attached to the torn portion of the tube to maintain the life of the embryo,

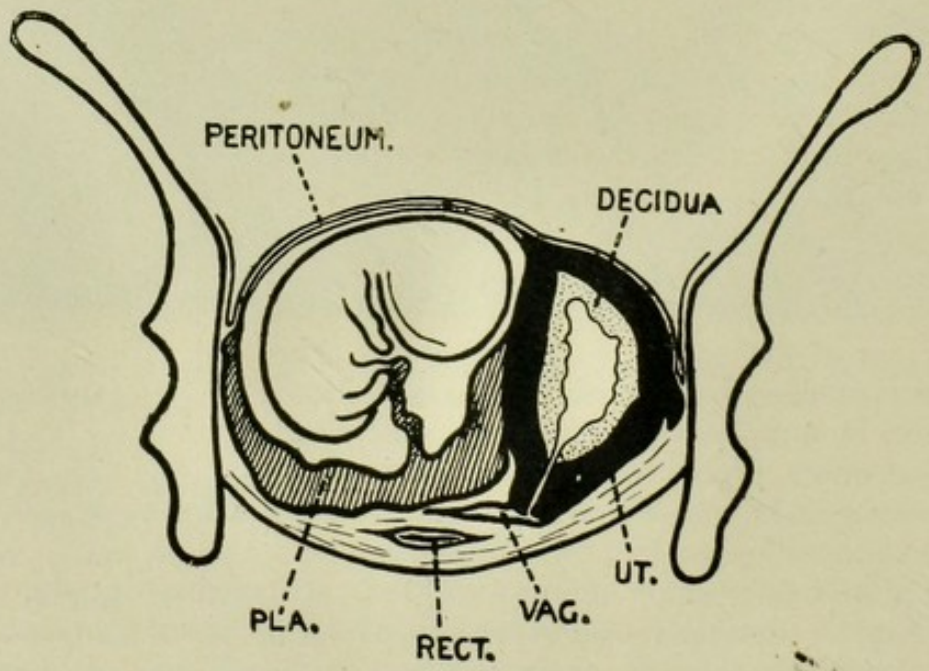

Fig. 270.—Ectopic gestation : intra-ligamentous, with the placenta below the fœtus. *Pla*, placenta ; *Rect*, rectum ; *Vag*, vagina ; *Ut*, uterus.

and then gives rise to the intra-ligamentous form of ectopic gestation. This may go to term, or may undergo secondary rupture in a short time.

The result of rupture into the broad ligament, if the ovum does not

[1] See Sutton, *loc. cit.* p. 322.

perish, depends now to a considerable extent on the relative positions of the fœtus and the placenta. If this lies *below* the fœtus it grows down into the connective tissue of the broad ligament, and implants itself on new tissues as it grows. It becomes attached beneath the peritoneum to neighbouring

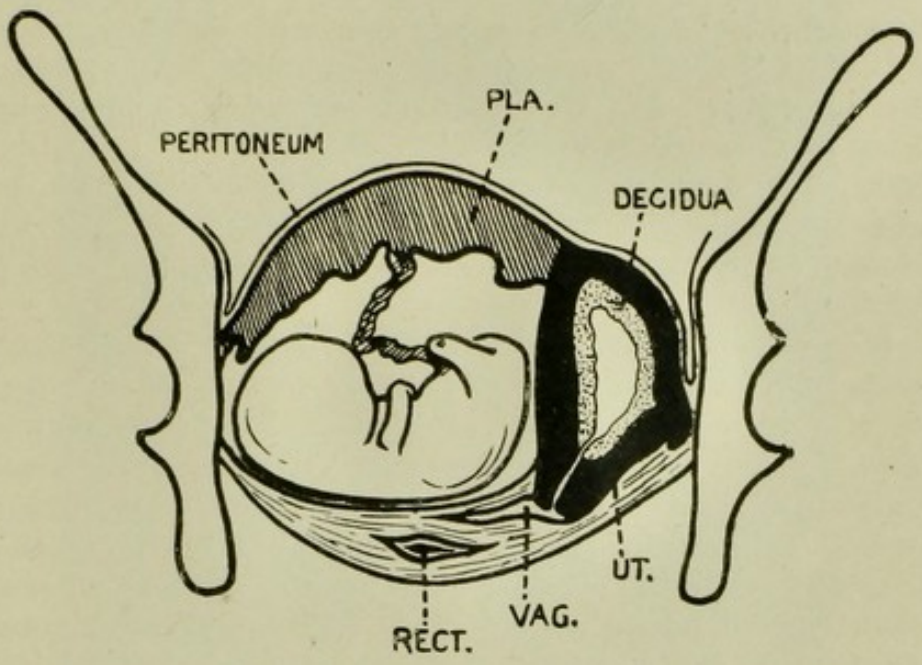

Fig. 271.—Ectopic gestation : intra-ligamentous, with the placenta above the fœtus. *Rect*, rectum ; *Vag*, vagina ; *Ut*, uterus ; *Pla*, placenta.

viscera, to the back of the uterus, or the front of the rectum, and to parts of the pelvic floor (fig. 270). The ovum as it grows lifts off these parts any peritoneal covering they may have.

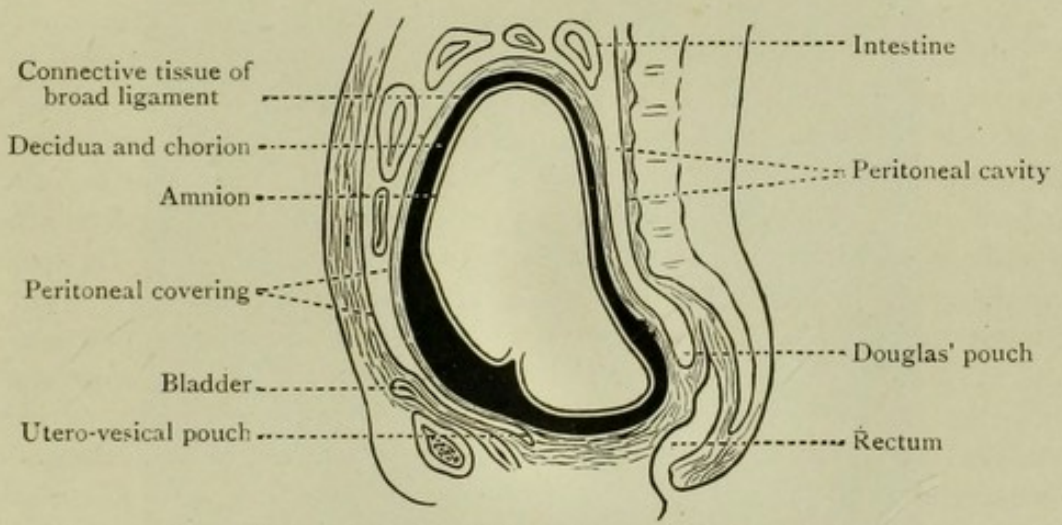

Fig. 272.—Sac and placenta in intra-ligamentous gestation (sub-peritoneo-abdominal).

If the placenta lies *above* the fœtus on rupture into the broad ligament, it is the fœtus and its membranes which burrow into the connective tissue, while the placenta is raised up gradually as the ovum grows, to the brim of the pelvis (fig. 271), and in Jessop's celebrated case [1] it covered the pelvis like 'the lid of a pot.' By the growth of the ovum, and the consequent stretching,

[1] *Obst. Trans.* vol. xviii.

the placenta suffers; its tissue is damaged by hæmorrhages, and the pregnancy is not so likely to go to term as when the placenta is below.

The walls of the sac in each case are formed partly of peritoneum, to the serous surface of which those surrounding organs which are covered by peritoneum become adherent, and partly of organs and structures from which the peritoneum has been more or less stripped. Among these organs is the ovary, the intimate connection of which with the sac has no doubt caused the impression that the gestation was originally an 'ovarian' one commencing in a Graafian follicle.

The sac, as the ovum grows, continues to rise, stripping the peritoneum off the adjacent organs and off the abdominal walls in varying degrees, and may be found to reach above the level of the umbilicus (sub-peritoneo-abdominal form, fig. 272).

Secondary rupture of the sac into the peritoneal cavity may occur at any time after the primary rupture of the tube into the broad ligament. It has been already mentioned that rupture may occur in both directions simultaneously. In secondary rupture such severe bleeding usually occurs that the woman dies unless operated on, and there is no chance of further development of the ovum. It is, however, possible that even now the pregnancy may go on, if the placenta is not too much disturbed or damaged; and it would be difficult to say, in most cases when the pregnancy is in a sac outside the tube and the broad ligament, whether its position was the result of the rupture of a tubal pregnancy direct into the peritoneal cavity, or of an intra-ligamentous gestation. In fact, in a very large majority of the cases it is impossible to say at all whether the sac is intra- or extra-peritoneal, and no doubt many cases have been described as 'abdominal,' *i.e.* intra-peritoneal, which were really advanced broad ligament gestations.

It is asserted, although it is not proved, that the fœtus, to thus survive either primary or secondary rupture, need not be still contained in its membranes after rupture. It is most unlikely, considering the absorbent power of the peritoneum, that this should be the case; and remembering the difficulty of determining the true relations of the gestation-sac to the peritoneum, cases observed in which the child was found floating free among the intestines must not be received as proving its possibility. In the case of ampullary or infundibular gestation, after rupture of the sac into the peritoneum or broad ligament, the fœtus may die. If this happen and the woman survive, the ovum is either absorbed with the hæmatocele produced, or the fœtus may become mummified, converted into adipocere, or into a lithopædion. The earlier ovum will be absorbed, and the later undergo one or other of the above changes; or suppuration may occur, and the abscess may burst into the bowel (commonest), through the abdominal wall (rarely), into the bladder or vagina, or even into the uterus or through the perinæum. Suppuration is what usually happens in the older gestations. Infection of the sac no doubt occurs in consequence of its proximity to the bowel. When the fœtus is converted into adipocere, the liquor amnii disappears and the sac falls in on its contents. After this, or after mummification (drying-up) of the fœtus, the sac may become calcified. Sometimes the fœtus becomes calcified too, and is converted into a lithopædion. The mummy or the

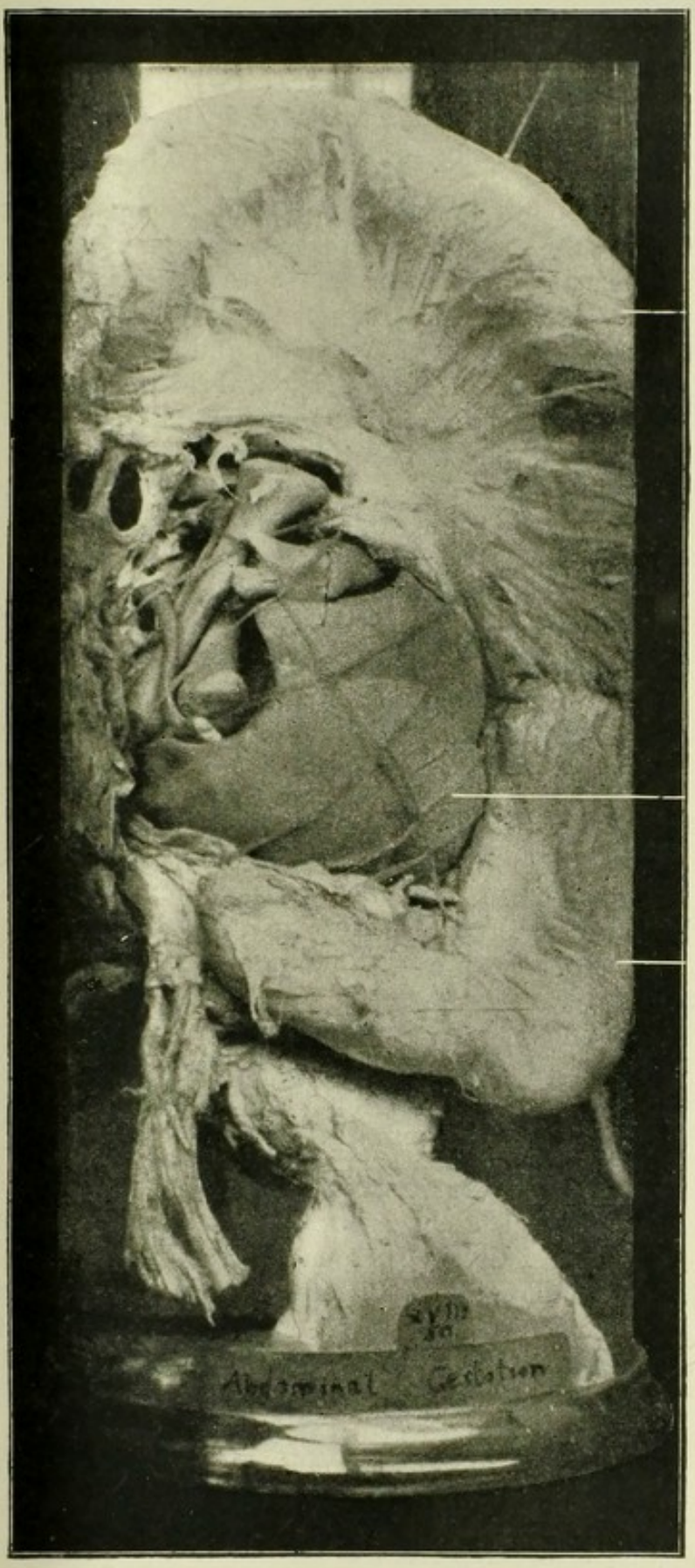

Fig. 273.—Fœtal bones in a sac formed by adherent intestines. (St. George's Hospital Museum.)

lithopædion may be retained in the abdomen for an indefinite time, and pregnancy has been known to occur during such retention.

Cases of long retention are extremely rare, and slight disturbances are very liable to set up suppuration in the sac.

If the ovum is dead, the hæmatoma is gradually absorbed, or may rarely suppurate, the pregnancy being at all events at an end.

Tubal Abortion.—Until the abdominal end of the tube is closed, it is always possible that the ovum may be extruded through it into the peritoneal cavity. This extrusion, which occurs in the earliest weeks, resembles abortion of an early intra-uterine pregnancy. Large quantities of blood, up to fifty ounces, may be lost in the process, and will, of course, lie in the peritoneal cavity, forming an intra-peritoneal hæmatocele if the woman survives the loss. Large amounts of blood have been found extravasated while the ovum was still in the tube, so that tubal abortion probably resembles ordinary abortion in that the bleeding persists until the ovum has been expelled.

The ovum is during or before this process converted into a blood-mole. Sutton points out that this accident during a tubal gestation accounts for many of the cases of so-called 'reflux of menstrual blood' when metrorrhagia has occurred; the metrorrhagia being that connected, as will be seen later, with expulsion of the uterine decidua formed in cases of tubal gestation.

In other cases a mole may be formed, and remain in the tube; and it may then form part of a hæmato-salpinx.

Interstitial.—This is a rare form. The gestation developes in the actual wall of the uterus at the place where the tube perforates this, and thus lies internal to the round ligament. As it grows the sac extends either into the uterine cavity or into the broad ligament, and the uterine wall expands over it.

It is very seldom that the pregnancy in this position goes on to term; rupture usually occurs before the fifth month. The time of its occurrence is, however, very variable.

The effect of rupture is an almost uniformly fatal one, partly because it occurs late (later than in the case of tubal pregnancy), and the vessels are therefore larger, and partly because the placental area is almost sure to be torn on account of the arrangement of the sac.[1]

Infundibular.—Part of the ovum is enclosed in the abdominal end of the tube, and part projects from the fimbriated extremity. This latter part is enclosed in a sac formed by the surrounding viscera. Among these is the ovary, which is intimately welded with the wall of the cyst, and is expanded over the ovum. In this situation development can proceed to term, for there is no limit to the growth of the ovum away from the tube but that set by the adhesions. If these adhesions give way new ones may be formed beyond them, and the sac thus re-enclosed. It has been suggested that in some cases the pregnancy has occupied a previously existing ovarian sac.[2]

Pregnancy in a rudimentary uterine horn may be included here, for it is clinically indistinguishable from tubal gestation, and imitates this in its

[1] See a case of Bland Sutton's. *Obst. Trans.* vol. xxxvii.

[2] Bland Sutton's *tunica vaginalis ovarii*; Vulliet: *A. f. G.* 1883, vol. xxii. p. 427.

mode of termination, namely, by rupture. The mass has in most cases before rupture been taken for a fibroid. After death or at operation, for the pregnancy cannot go on after rupture, it may be made out that the Fallopian tube

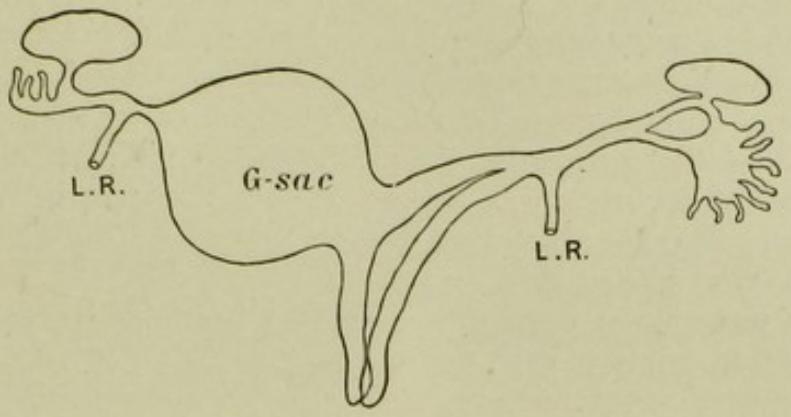

Fig. 274.—Pregnancy in a rudimentary horn of the uterus, showing relation of round ligament (*L R*) to gestation sac (*G* sac).

rises outside the sac, and is normal in length. The round ligament also arises outside the sac. In tubal gestation both arise internal to the sac, and the tube is much curtailed (compare figs. 274 and 275).

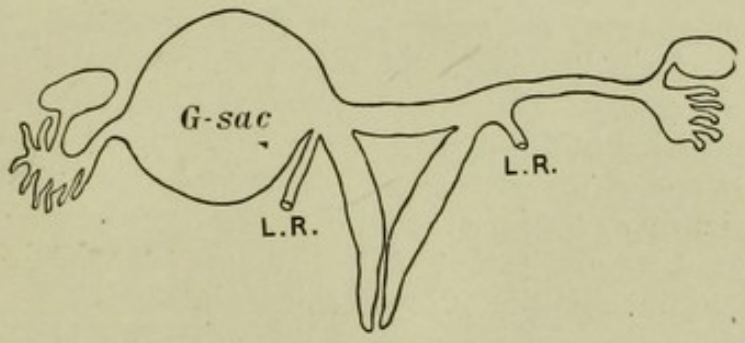

Fig. 275.—Relations of sac to round ligament in tubal gestation ; *L R*, round ligament.

Changes in the Uterus and Endometrium of Uterine body.—No case of ectopic pregnancy developes without certain changes in the uterus. This organ grows during the pregnancy without changing its shape up to a certain size, namely to that of a third or, at the outside, a fourth month's gestation ; though it may increase in weight beyond this time, and may continue to do so as long as the pregnancy goes on.

The endometrium forms a decidua indistinguishable from the decidua vera, but of course having no serotina or reflexa. This decidua is cast off when the embryo dies ; or at the time of the false labour at term, if this period be reached, or before term.

It is sometimes expelled as a complete cast. It is then thick (about $\frac{1}{4}$ to $\frac{2}{5}$ of an inch), and its size corresponds to that of the enlargement of the uterus existing, measuring about $3\frac{1}{2}$ inches as a rule from fundus to the lower end.

The uterus, as already mentioned, is pushed out of its normal position by the growing ovum and its sac ; the displacement is usually somewhat forwards, owing to the fact that the tumour mostly occupies or bulges towards Douglas' pouch ; and almost always considerably to one side.

Symptoms and Signs.—Sometimes a woman who is the subject of this affection may have the symptoms so well marked that it is impossible to overlook its existence; while in other cases there may be for a time nothing to suggest that the pregnancy is abnormal. In some instances, with the symptoms of pregnancy present, there have been found certain abnormal phenomena which have suggested a physical examination; and the signs then found have caused suspicion of, or indicated the actual condition. In yet another kind there have been no definite signs of pregnancy at all, and the symptoms of rupture, mild, severe, or even fatal; or later still, the discharge of bones through a fistulous opening, have been the first events which suggested the true nature of the case.

It will be understood from this statement that the recognition of early ectopic gestation is, as a rule, not an easy matter. In fact the instances where tubal gestation has been recognised before rupture might only a short time ago almost be counted on the hand.[1] It will be remembered that rupture in this variety commonly occurs before or about the eighth week, and that at this time the indications of pregnancy in any case are not very marked or characteristic.

Symptoms.—In a typical case the patient has been regular in menstruation for some time. She has probably been sterile for several years of married life, either before or after having had children or miscarriages. She misses a period, and may or may not suspect that she is pregnant; but she shortly has irregular attacks of bleeding, and, as a rule, combined with these spasmodic abdominal pains. The symptoms so far may suggest a threatened abortion, and suspicion of this may be strengthened by the passage of portions of decidua. Or one of the attacks may be more intense than the preceding ones, and sufficiently so to cause collapse. The occurrence of collapse and its degree depend on the extent of the rupture which has now probably happened, and on the quantity of blood extravasated.

If this attack be survived, others of a like character may follow, and the hæmorrhage may sooner or later be fatal; or the ovum, being torn from its base, may die and be absorbed with the hæmatocele formed by the extravasated blood, thus ending the matter; or the case may go on as an intraligamentous pregnancy with a growing tumour, further signs of pregnancy, and evidence of the presence of a living fœtus. In this last case the patient usually comes to have much abdominal pain, with symptoms of compression of the bladder and rectum, and possibly of inflammation about the tumour. These conditions go on till term is reached or until the false labour occurs, and a decidual cast, if one still remains in the uterus, is expelled. In some cases secondary rupture takes place, when the patient almost always dies of hæmorrhage or peritonitis; but oftener the fœtus becomes a mummy or a lithopædion, and is retained for some time, finally becoming expelled through a fistulous opening. Otherwise the cyst shrinks and undergoes with the fœtus the changes already described.

In rare cases of interstitial gestation the ovum may be expelled through the uterus, and is then, of course, likely to be mistaken for an ordinary abortion.

[1] Of late, the cases which are diagnosed and operated on before rupture have become much more numerous.

Signs.—The physical signs may be divided into three groups, each group being characteristic of a period. In the first four months of pregnancy the mass formed by the ovum and its surroundings has much in common with other tumours which may occupy the pelvis ; in the second half of pregnancy the gestation resembles most an intra-uterine pregnancy ; in a third period, when the fœtus is dead, it forms a mass which lies in the abdominal cavity, and it then may or may not be giving rise to symptoms of a dangerous character. A description of the local changes produced by each kind of ectopic gestation has been given. It will, therefore, be easy now to understand how the physical signs are brought about.

In the **first four months** of pregnancy the results of vaginal and bi-manual examination are much the same as those got from examining cases of tubal disease or of perimetritis, namely, a mass on one side of, or behind, the uterus.

The uterus cannot, as may happen in these cases also, be always defined. If it is defined, it is found to be somewhat enlarged, but not to the extent that would exist in an intra-uterine case at the same stage of pregnancy. It is pushed to one side to a varying extent by the mass, and sometimes, but not in a very early case, fixed. If the sac bulges into Douglas' pouch the mass there may be mistaken for a retroflexed gravid uterus, especially where the fundus cannot be found in its normal position ; and both conditions may cause retention of urine. The occurrence of contractions in any mass show that it is uterine. This, if elicited, will be a final point in deciding whether such a mass is gestation sac or misplaced gravid uterus.

The use of a sound would, as a rule, show the direction and size of the uterine cavity, though in cases of acute retroflexion it might not be possible to pass it beyond the angle of flexion, and a mistaken conclusion might be arrived at by its means. It is undesirable to pass a sound in these cases, at all events until every other means of clearing up the diagnosis has been exhausted ; for if the ovum is outside the uterus the tube may be made to rupture by contractions set up by the passage of the instrument ; if it is inside, the ovum will most likely be expelled. If the uterus is shown to be empty, a small portion of the endometrium may be curetted off and examined microscopically to see if any decidual cells are present. If the scraping proves to be decidua, it is very valuable, but not conclusive,[1] evidence of ectopic gestation, supposing abortion to be excluded.

The undoubted growth of a mass by the side of the uterus is, if fairly rapid and accompanied by symptoms of pregnancy and by pain, strongly indicative of ectopic gestation. In the case of tubal gestation there will only very rarely be an opportunity of making out any progressive enlargement, but in intra-ligamentous cases this sign may be recognised.

Rectal examination will often give valuable information as to the connections of the mass.

The cervix is, as a rule, found to be little if at all softened.

After rupture.—In tubal pregnancy, after rupture into the abdomen has happened the signs in a patient who survives are eventually those of a hæmatocele, and, as a rule, those of a large one.

[1] See cases recorded by W. S. A. Griffith, *Obst. Trans.* vol. xxxvi., and by the author, vol. xxxviii., in both of which a typical entire decidual cast was expelled in the absence of pregnancy.

If the woman is seen soon after rupture there is little to be felt. There may be some thickening on one side of the more or less fixed uterus, but if rupture has happened in the first few weeks there will probably be nothing but slight abdominal fulness. In a day or two the effused blood hardens, and then forms the tumour characteristic of an intra-peritoneal hæmatocele. If rupture and bleeding occur on several occasions, the blood-tumour will increase more or less distinctly after each attack. Under favourable circumstances the hæmatocele will be eventually absorbed.

When the rupture is intra-ligamentous there is less shock and more immediate swelling, and the swelling is felt to be limited and to resemble that of parametritis. The blood may be both intra- and extra-peritoneal, and is sometimes found widely diffused beneath the peritoneum.

In the second half of pregnancy there is no difficulty, if the child is alive, in recognising the fact that the woman is in the family-way. It is much easier, too, to make out where the pregnancy is. The fœtal cyst does not contract under any circumstances ; it is usually more to one side of the belly than the other ; and the uterus, as can often be established, is distinct from the cyst, being pushed away to the opposite side. If the uterus cannot be defined bimanually, the lower segment can be felt per vaginam not to be globular as in normal pregnancy ; the cervix is very slightly if at all softened, and points to the same side as the cyst, and not away from it as it would if the cyst consisted of the tilted uterus.

The uterine sound should, if used at all, here be used with very great caution, and under the same conditions as in the early months. Localisation of the placenta is sometimes possible if it is on the anterior abdominal wall, or between this and the fœtus. This can only be done by palpation ; no stethoscopic signs can be relied on.

The heart-sounds can be made out and fœtal movements felt while the child is alive. Ballottement can be obtained in many cases. When the fœtus dies before or after false labour these signs of course cease, as does another sign of pregnancy—namely, the secretion of serum by the breasts.

In the third period, as above defined, **the death of the fœtus** reduces the gestation-sac and its contents to the level of a solid tumour, which is fixed in some part of the belly, and is ready to undergo further changes. Changes may occur at once, and consist in suppuration of the sac and its contents. The patient will then have the signs of septic absorption combined with those of an abdominal mass, and possibly the history of a previous pregnancy. In the absence of such a history, or of recognition of the fœtal parts through the parietes, the condition is probably undiagnosable without an exploratory operation.

If a woman is seen when fistulæ have formed by perforation of the abdominal wall, or by communication of the cyst with the rectum, vagina, or bladder, the state of things is not difficult to recognise owing to the bones which are discharged. If the change is one of mummification or calcification, there is nothing characteristic but the absence of growth in the mass. As already mentioned, a mummified fœtus or a lithopædion may at

any time cause irritation, and give rise to the same physical signs as a recently suppurating cyst.

Diagnosis.—For the purpose of making a differential diagnosis it is again necessary to divide ectopic gestation into the two periods of (*a*) the first four months and (*b*) the remainder of pregnancy and subsequent periods, since the conditions likely to be confounded with it in each of these periods separate themselves naturally into two groups.

In the first half, before any sign of fœtal life is, as a rule, found beyond mistake, ectopic gestation must be distinguished from :—

(1) Ordinary pregnancy (with certain added conditions).
(2) Retroflexed or retroverted gravid uterus.
(3) Abortion.
(4) Fibroids (with certain added conditions).
(5) Tubal diseases, peri- and para-metritis, broad ligament cysts.
(6) Ovarian tumours.

(1) *Intra-uterine pregnancy with pain, and lateral displacement owing to adhesions, inflammatory masses, or tumours*

Intra-uterine	*Extra-uterine*
Signs of early pregnancy as a rule well marked	Signs of early pregnancy not always present or complete
If the uterus can be made out separately from the mass, it corresponds to the period of pregnancy, as does the softening of the cervix	Uterus, if made out separately, is too small for the period, and the cervix is not enough softened
Uterine contractions may be elicited	No contractions in the mass
No hæmorrhage	Irregular hæmorrhages and partial discharge of decidua, and the continued growth of the mass

(2) *Retroflexed or retroverted gravid uterus; signs of pregnancy—mass felt behind the cervix, possibly ballottement—pain and pressure symptoms possibly present*

Retroflexion and Version	*Ectopic Gestation*
Uterus not found elsewhere	Uterus may be defined in front of mass
Mass as a rule reducible,[1] or at least movable without force	Mass often fixed, but this is not constant
No hæmorrhage as a rule, unless abortion is occurring	Hæmorrhage and discharge of decidua
Pain usually 'bearing-down' in character	Pain usually acute and spasmodic
Uterine contractions	No contraction in mass

[1] If the mass is fixed diagnosis may be impossible.

(3) *Abortion with inflammatory masses or tumours. Hæmorrhage and discharge of membranes with pain*

Abortion	*Ectopic Gestation*
Uterus, if differentiated, enlarged; sound passed if necessary	Uterus, if made out, not much enlarged
Uterine contractions may be felt	No contractions in mass
Cervix soft and patulous	Cervix almost unchanged
Chorionic villi are present in the membrane discharged	No villi found in discharged membrane
Uterus ceases growing	Mass continues to grow if no rupture occurs

(4) *Fibroids with hæmorrhage, especially if complicated with perimetritis and fixed, and if the cervix is softened*

Fibroids	*Ectopic Gestation*
History of previous dysmenorrhœa and hæmorrhage	Usually amenorrhœa for one or two months
No symptoms of pregnancy	Symptoms of pregnancy may be present
Uterine mass usually definite	Uterus, if defined, not markedly enlarged
No discharge of decidua	Decidua often discharged

(5) *Tubal disease, peri- and para-metritis.—Physical signs much alike* (fig. 276), *and in a certain proportion there is menorrhagia or metrorrhagia at some time or another, usually early, in the course of the disease*

Inflammation	*Ectopic Gestation*
Cause possibly found (Gonorrhœa, abortion)	
No symptoms of pregnancy	Usually symptoms of pregnancy
Mass usually diminishes somewhat on rest	Mass grows
Fever occasionally	No fever
No decidual discharge	Decidua often discharged

The diagnosis here is very difficult, and is usually not made before rupture of the tube.

Rupture of an aneurism, rupture of the stomach or intestine, intussusception, ovarian tumour with twisted pedicle, may each on account of the sudden shock and collapse they cause be confounded with ruptured ectopic gestation.

In the second half of pregnancy the diagnosis, as regards pregnancy, is usually easy *when the fœtus is alive*, and the distinction has to be made only

between intra- and extra-uterine gestation. If the child is dead, however, the gestation sac may be confused with other abdominal tumours such as dermoids, or malignant disease of the pelvic viscera or peritoneum. If the fœtus is alive, attention has to be paid to the position of the mass, whether central or lateral, and to the actual situation and size of the uterus. If this can be separately examined bimanually the distinction is easy ; but even if the lower segment only can be reached, its shape and curvature, and its position with regard to the mass, will be sufficiently indicative of the condition of its body. In ectopic gestation the cervix is little if at all softened ; the lower segment is not lax, and its curvature is small ; it is pushed to the opposite side by the gestation sac ; and there is no well-

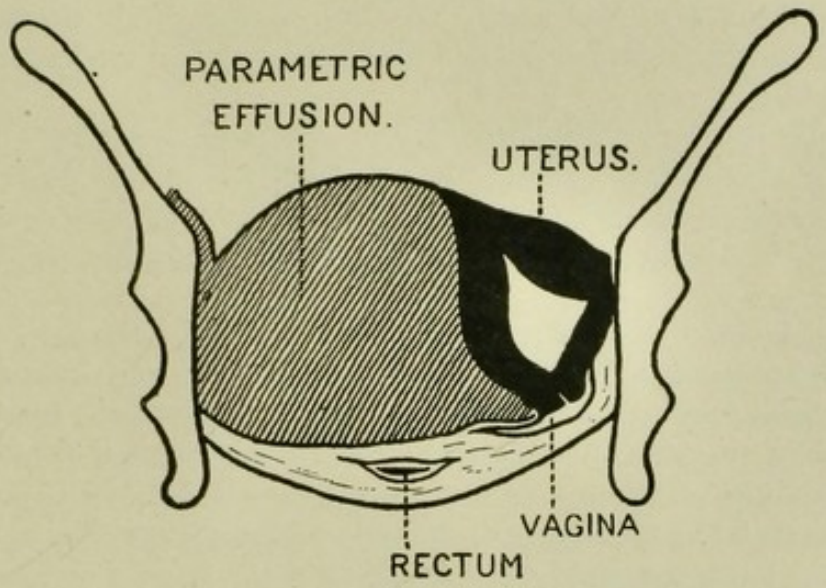

Fig. 276.—Para-metritis. (Compare with figs. 270 and 271.)

defined impulse conveyed to the cervix from the upper part of the mass felt in the abdomen.

Uterine contractions and relaxations are absent from the main part of the mass.

The fœtal parts may be abnormally distinct as felt through the abdominal wall in extra-uterine cases, and the placenta may also be made out by palpation. It should be remembered that some cases of scanty liquor amnii have been taken for cases of extra-uterine gestation on account of this distinctness of outline and seeming nearness to the surface.

When the fœtus is dead the diagnosis may rest on the history alone, for the physical signs may be insufficient to clear up the case. An exploratory incision is here the proper measure to adopt, unless there is fairly definite history of some inflammatory cause producing a large peri- or para-uterine swelling, or of the occurrence of a hæmatocele at an early period of ectopic gestation.

Prognosis.—The prognosis almost entirely depends on (1) the recognition of the case in time to avert the numerous accidents that have been described, and (2) the proper management of the case when its nature is ascertained or strongly suspected.

This is most true with regard to the first few months of such a pregnancy

for then the danger lies in rupture alone, and the woman is made safe if the gravid tube is diagnosed and removed, or if the symptoms of internal hæmorrhage are at once assigned to their proper cause and laparotomy immediately performed.

In the later months the causes of danger are more various, and lie in the changes which may occur in the mass if untreated—namely, rupture, suppuration, and in the difficulty, in any operation, of dealing with the placenta satisfactorily, and of checking the hæmorrhage from its site. As regards the child, it can only be born alive if operation is undertaken after it has become viable. It is often malformed.

Treatment.—In former years, owing to the reluctance felt by medical men to open the abdominal cavity, almost any seemingly milder expedient was resorted to which gave a chance of putting an end to the pregnancy by killing the embryo.

Such methods were : puncture of the cyst and fœtus from the vagina ; the administration of strychnine to the limit of the mother's safety ; starvation ; blood-letting ; electrical currents passed through the cyst, faradic or galvanic ; electro-puncture ; and the injection of morphia (gr. ½ or so) into the cyst.

These methods have the following drawbacks. In the first place, if the fœtus is killed it is left behind to be absorbed. This may happen, it is true, if the ovum be young and soluble enough, but it is also possible for the dead embryo to act as a cultivation ground for septic organisms, to suppurate, and thus cause trouble. If young enough to be absorbed it is just the case when the operation to be immediately discussed—namely, removal by laparotomy —is likely to be the easiest and most favourable.

In the second place, these methods of treatment may have no effect on the fœtus, and this may survive, for instance, the strongest faradic current capable of being borne by the mother, or the treatment may be fatal to her—and this is the commonest result—by suppuration of the sac and peritonitis, or by hæmorrhage and injury to the intestines, or by bringing about contractions in the sac, and rupture.

In the third place, valuable time is lost and the risk of rupture continues.

The only satisfactory method of dealing with an ectopic gestation, wherever seated, is that of extirpation as soon as possible after the diagnosis is made.

Our experience of this affection and its results to the patient under all circumstances is now very large. Even as long ago as 1891 (long in the history of our knowledge of the matter) Schauta collected 241 cases in all stages where with expectant treatment the mortality was 68·8 per cent. ; while in 335 which were operated on it was 26 per cent. At the present time the latter percentage would be found very much smaller than this.

The character of the operation required at each different period in the history of an ectopic gestation varies in its degree of difficulty, and thus in the prognosis for the patient.

While the gestation *sac is still contained in the tube, or this has only recently ruptured*, and while no adhesions to the peritoneum have been formed by the placenta, the operation is as a rule fairly simple, and the tube

and its contents can be removed completely. During the *latter half of pregnancy* this removal is often most difficult and dangerous, owing to the attachments of the placenta to a large area which possibly includes intestinal surface, and because of the non-contractility of the placental site. An exception to this rule is found when the ovum is intra-ligamentous, and can be more safely separated.

In discussing the operative treatment proper to each class of case, no attempt at detail will be made, but the principles and the general scheme of procedure only will be noticed in each instance.

Class I.—Cases where ectopic gestation is diagnosed or strongly suspected, but direct signs of a living child have not yet appeared. This will include cases up to the end of the fourth month.

The gestation sac may be—

(*a*) Tubal and unruptured.
(*b*) Ruptured, whether tubal or intra-ligamentous.
(*c*) Intra-ligamentous, not having secondarily ruptured, and growing.

(*a*) *Unruptured tubal.*—A case of this kind will necessarily be an early one, of not more than two or two and a half months. The sac can be isolated, and its pedicle or base ligatured, as in the ordinary operation for removing a diseased tube. Great care in handling the gravid tube must be exercised, for fear of rupturing it before the pedicle and its vessels have been secured. The opportunities for doing this operation are rare (though becoming less so), for the cases are not very often diagnosed before things have developed into the next stage.

(*b*) *Tubal or intra-ligamentous, ruptured into the Abdomen.*—By far the largest number of opportunities for active interference occur under these circumstances, and it is only necessary for a woman to have evidence of serious intra-abdominal hæmorrhage not due to some inevitably fatal event, such as rupture of an aneurism, to make abdominal section the only course to be pursued.

With such evidence the first thing to be done on opening the abdomen is to find the source of the bleeding and arrest this ; and then the peritoneal cavity can be cleansed and other details attended to.

In the case of rupture after opening the abdomen, the blood which will be found filling it is to be disregarded, and the uterus identified by the fingers inserted through the wound. The fundus uteri is the best guide to the tubes ; these are rapidly examined, and the one found to be affected seized, brought up to near the wound, and a large Spencer Wells' bent ovariotomy forceps carefully adjusted to the broad ligament internal to and beneath the gestation sac. This will compress the ovarian arteries and veins, and all the hæmorrhage will be checked. Care must, of course, be taken to include no intestine or omentum with the pedicle. The blood is now washed out of the abdomen by flushing with warm water, or by sponging alone, care being taken to remove it as completely as possible, the pedicle ligatured, and the patient treated as after an ovariotomy. If rupture has occurred some time previously and there is old blood in the peritoneal cavity among adhesions, it may by some few operators be considered necessary to drain.

If the case is an intra-ligamentous one, the bleeding surface is more

difficult to deal with. Large forceps should be at once placed, one on the uterine and one on the pelvic side of the mass, the rupture enlarged, and the tumour rapidly shelled out of its capsule, sponge-pressure being used, or pressure-forceps being put on where necessary during the separation. Ligatures are to be applied to bleeding points, or where the surface is too flat the vessel may be underrun with a needle armed with silk. The cavity remaining in the broad ligament may have to be plugged with iodoform gauze, and its edges secured to those of the wound in the abdominal wall, or it may be transfixed and stitched up and the cavity obliterated, or drainage may be provided for through the vaginal fornix, according to circumstances.

(*c*) *Unruptured intra-ligamentous, growing.*—The broad ligament should be cut through in a spot as free from vessels as possible, the ovum shelled out as before, bleeding points and surfaces ligatured or underrun, and the cavity treated as in (*b*). It has been necessary to remove the uterus in a few cases where it has formed part of the sac wall.

Class II.—Cases where there are direct signs of a living child. This will include instances from the end of the fourth month up to term ; and

Class III.—Child dead recently or remotely. The principles which govern the treatment of cases of an earlier date have not to be modified. The fœtus, however, in Class II. may be considered as able, or nearly able, to survive, and it has been a question in not very remote times whether it should or should not be unhesitatingly sacrificed in favour of the mother.

It is often ill-formed ; yet recently many perfect children have been delivered.

The question may be put as follows : Should the fœtus be removed before it is viable, so as to at once to put the woman on the way to safety ; allowed to develop until it is viable, and then be removed ; or allowed to die in the woman's abdomen, and there remain two or three months so as to diminish, as will be explained, the risk of hæmorrhage at the operation which will undoubtedly have to be undertaken sooner or later?

The operation in the case of a living child has been called 'primary,' and operation after waiting for the death of the child and diminution of the placental circulation is known as 'secondary.' The following facts form a basis on which to argue.

1. It has already been mentioned (p. 322) that the risk of suppuration after a lithopædion has been formed is very great.

2. The fact that so many cases have done well, saving the mother and often the child, and that in unsuccessful cases the reasons of failure can as a rule be recognised and avoided in future, tend to show that the results of the 'primary' operation will be better and better as more experience is acquired.

We shall, on the other hand, never be able to diminish the risk of sepsis when the fœtus is allowed to remain, after its death, in the mother's abdomen.

3. The pregnancy is probably intra-ligamentous, and this chance must be considered as being in favour of the primary operation, for the sac may be able to be opened without wounding the peritoneum ; primary operation is desirable also on account of the risk of fatal rupture if the placenta is on the top.

We may therefore adhere to the principle given at the beginning, on p. 330, and whether the fœtus is alive, if dead (just dead), dead for some time, suppurating, or if fistulæ are formed, operate at once.

The details of the operations required in the conditions just enumerated will not be gone into in this work. They are to be found in works on the Diseases of Women.

It will be well, however, to indicate the main principles which govern the procedures in each group.

The ideal result in each operation is that the placenta and sac shall be completely removed at the time, and that the woman shall be eventually none the worse. This ideal has been attained in several cases ; and in several cases also, a viable child has been obtained.

The method of operation by abdominal section will be considered first in each class of case ; and the question of operation by the vagina will be discussed.

Fœtus Alive or Just Dead.—In removing the fœtus by abdominal section the great difficulty lies with the placenta, both at the time of operation and afterwards.

The incision in the abdominal wall and sac must be made so as to, if possible, avoid the site of this organ. By very careful palpation it may be found that some part of the fœtus is very plainly to be felt, with nothing but the abdominal wall intervening between it and the external hand ; this marks the best place to make the opening.

The incision should be made on that side on which the sac is felt. The sac is then cut into extra-peritoneally if possible, unless the fœtus is floating freely in the abdominal cavity, and the child extracted by whatever part of it is presenting. A pressure-forceps is put on the cord four or five inches from the fœtal end, and the cord is divided on the maternal side of this. The child is then handed to an assistant specially deputed to look after it. Care must be taken that the cord is not pulled upon. The cord remaining attached to the placenta must be left untied, in order that the blood may escape freely, and the bulk of the placenta be thus reduced.

The relations of the sac are now to be made out, and the possibility of its removal considered. If this is likely to be very difficult or impossible, as is almost certain, the edges must be carefully stitched to the abdominal wound, so as to entirely shut off the peritoneal cavity if this has been opened, and the interior of the sac drained. A large drainage tube must be used, and the funis is to be cut short near the placenta.

The opening is now closed round the tube. The sac may be previously washed out with plain water, or water containing an antiseptic ; and the placenta well dusted with iodoform or aristol ; or an attempt may be made to dry up the placenta by freely applying some powder, such as benzoate of soda (Werth) or a mixture of tannic and salicylic acids. If one of these powders is employed the sac and its opening are to be plugged with strips of iodoform gauze, instead of using a drainage tube.

The opening must be kept free, and no accumulation of fluid allowed. The placenta, if it comes away, will do so in shreds ; and the wound will slowly granulate up.

There is some danger of septic infection of the placenta from intestines,

and great care must be taken to keep the sac sweet, by renewing the plugs of gauze at intervals of not more than three or four days at first, and as often as necessary afterwards. If at the time of operation the placenta and membranes can be stripped off the sac-wall this should be done.

If any bleeding arise from the sac during the operation, or during the separation of the placenta, plugging with iodoform gauze will arrest it.

When the child has been dead for some weeks before operation the placental circulation will probably be so much diminished that the placenta may be removed without much bleeding. This should be done if possible. If not, the case must be treated as above.

If the pregnancy be intra-ligamentous, it may be possible to remove the greater part of the sac by enucleation, tying the connections of the sac and inner surface of the broad ligaments as the separation goes on. The remaining cavity can then be drained or obliterated in the way used in the case of broad-ligament cysts ; or, if the hæmorrhage be troublesome, plugged with iodoform gauze. Plugs in both cases should be removed in two or three days if the bleeding has not been very great, but they may be left in for four or five days if it is considered advisable.

Operation by the Vagina.—In this method of removing an extra-uterine ovum the sac is opened through the posterior fornix of the vagina. It is only where fœtal parts can be distinctly felt, with no placenta intervening between the vaginal wall and the child, that it can be used. There is no doubt that this is a good operation when suppuration has taken place in the sac, and the fœtal parts are being expelled through the vagina. It is recommended by Herman,[1] when the fœtus is presenting by the head, foot, or breech, so that it can be extracted without altering its position, and when it is quite certain that the placenta is not in the way. A few children have been delivered alive in this way.[2]

It is, however, a dangerous operation on account of want of control over the bleeding that may occur ; and from the risk of rupture of the sac, and the resulting general peritonitis ; or if there is no sac, of direct infection of the peritoneum. There is also some risk of wounding intestine, if a coil has become adherent in the line of section.

If, however, the fœtus has been dead long enough for the placental circulation to have become arrested, or still more, if inflammation has begun, the question of vaginal incision is to be considered. Drainage of the sac should be most carefully provided for, and the sac may be occasionally washed out ; or if any symptoms of sepsis arise, it may be irrigated frequently.

Operation on Fistulæ.—If the fistula is external, the opening should be enlarged by stretching with tents or other dilators, and if necessary by cutting (care being taken in the latter procedure that the peritoneum is not opened), the pieces removed, and the cavity completely drained.

If the fistula be into the bladder, the urethra should be first dilated and the state of things investigated : very likely the fragments can be removed in this way. If necessary for complete examination, vaginal cystotomy must be performed. If the remains of the fœtus cannot thus be extracted without

[1] *Obst. Trans.* vol. xxix. 1887.

[2] King, *Lond. Med. Reprints*, vol. xii. p. 241, 1820; and Mathiesen, *Obst. Trans.* vol. xxvi. p. 132, 1884.

much damage to the bladder or other organs, the sac should be cut down upon through the abdominal wall immediately above the pubes, avoiding the peritoneum. Cases which discharge through the bladder are always sub-peritoneo-pelvic.

Discharge through the rectum is sometimes spontaneously completed. If not, and septic symptoms arise, an abdominal operation would be the safest way out of the difficulty as a rule, unless the opening is so near the anus as to be within easy reach.

CHAPTER XLVI

HÆMORRHAGES DURING PREGNANCY

THE period during which pregnancy lasts is naturally one of amenorrhœa. Any hæmorrhage from the vagina is therefore abnormal, and should be carefully investigated. Among the causes of bleeding, some act during the early months more especially, some during the later, and some throughout the whole period.

The causes more characteristic of the *first half* are :

Abortion, proceeding or only threatened ;
Hydatid mole ;
Carneous mole ;
Ectopic gestation ;
(?) Menstruation during pregnancy.

Of these, abortion and the two kinds of mole have been already dealt with ; ectopic gestation is treated of in Chapter XLV ; and the last will be here discussed.

In the *latter half*, more particularly in the last two months of pregnancy, hæmorrhage occurring then for the first time is almost invariably due to detachment of the placenta.

Bleeding from detachment of a normally situated placenta is called Accidental Hæmorrhage.

That from a placenta occupying some part of the lower uterine segment (Placenta Prævia), Unavoidable Hæmorrhage.

At any time during pregnancy, the hæmorrhage may be due to disease of the cervix—erosion, cancer, or polypi ; or to other accidental complications, such as urethral caruncle or ulceration of vagina ; or to wounds, especially if enlarged or varicose veins are involved. All these conditions are likely to lead to much freer bleeding during pregnancy than under ordinary circumstances, because of the venous engorgement then existing. Hæmophilia, though rare in women, has been recorded as giving rise to attacks of uterine hæmorrhage, not usually ending in abortion.

Menstruation during Pregnancy.—It is not a very uncommon matter for a woman to have what seems to be a monthly period once after conception. Very rarely this happens twice, and still more seldom oftener than

this. In the absence of one or more of the causes in the third group, the bleeding must be due either to a threatened abortion or to menstruation. In a very large majority of cases it will have to be put down to a threatened abortion ; for the process of menstruation, involving as it does exfoliation of a certain amount, even if only the most superficial layer of the endometrium, with hæmorrhage into its substance, is very unlikely to go on without considerable risk to the continuation of pregnancy. There is, of course, a potential cavity between the decidua reflexa and decidua vera up to the third month, and blood may be discharged without interfering with the ovum. The more fully, however, cases of alleged menstruation during pregnancy are investigated, the more of them are found to be explained by some morbid condition, or anatomical aberration such as a double uterus. To make a general statement ; one monthly bleeding may be allowed to pass as a menstruation in the absence of any discoverable cause or of further disturbance, but any repetition of this should always be looked upon as a threatening of abortion, and the patient treated on this assumption. It has been mentioned that abortions are more prone to happen at what would, had the woman not been pregnant, have been menstruations ; and that abortion may be threatened on several such occasions in succession.

The *diagnosis and treatment* of cases where the bleeding is due to abnormalities of pregnancy will be found in the chapters on the Pathology of Pregnancy. That of wounds and other incidental causes is discussed in each special case.

Accidental Hæmorrhage

Definition.—Accidental hæmorrhage means hæmorrhage which is not a necessary part of labour, and which is usually defined in *hæmorrhage occurring beneath a normally-situated placenta.* It is so called to contrast it with the *unavoidable* hæmorrhage which occurs during the dilation of the cervix in labour when the placenta happens to be attached to the lower segment of the uterus, constituting a placenta prævia.[1]

Causation.—In some cases this disorder is to be traced to a blow on the abdomen or to a fall or some over-exertion, by which forcible rupture of vessels and detachment have been brought about. Very often, however, no such cause is to be found, and the separation must be due to disease of the uterus, or of the maternal or fœtal placenta ; and occasionally it comes on in the night after the woman has been at rest for some time. It is not common in primigravidæ ; and occurs, as a rule, in anæmic and debilitated subjects, and women who have borne many children. It is thus probably due in nearly all cases to some abnormality in the decidua. Interstitial and submucous fibroids have been found in connection with this kind of bleeding, and may possibly bring it about by producing irregular uterine contractions. Mental shocks also have been said to set up sufficient local contraction to detach some of the placenta, and certain blood diseases (of which anæmia

[1] Hæmorrhage often occurs in placenta prævia before labour has begun, and is then really of the nature of accidental hæmorrhage, as will be seen later.

has been already mentioned) including the group of symptoms named purpura hæmorrhagica, are associated with a tendency to sub-placental hæmorrhages (John Phillips). Bright's disease is not improbably an important cause.

Anatomy.—The blood effused beneath the placenta from the maternal sinuses usually finds its way to the edge of the decidua at the internal os, and escapes per vaginam, percolating through the looser layer of decidua, or forcibly separating the membranes at or about this plane ; and causing further bleeding by tearing fresh vessels.

The hæmorrhage rarely is '*concealed*,' which means that the blood is retained in the uterus, not escaping by the vagina. This retention is effected by (*a*) adhesions at the edge of the placenta. A considerable amount of blood may then collect beneath the placenta. (*b*) The membranes may be abnormally adherent round the edge of the internal os, and the uterine inertia always present in cases of this kind of hæmorrhage allows a large collection of blood beneath the membranes. (*c*) The head of the fœtus may fill up the lower uterine segment. (*d*) Rarely the blood has been found to break through the membranes into the amniotic cavity. In nearly all cases, however, even when the mass of the blood is retained, there is some hæmorrhage externally.

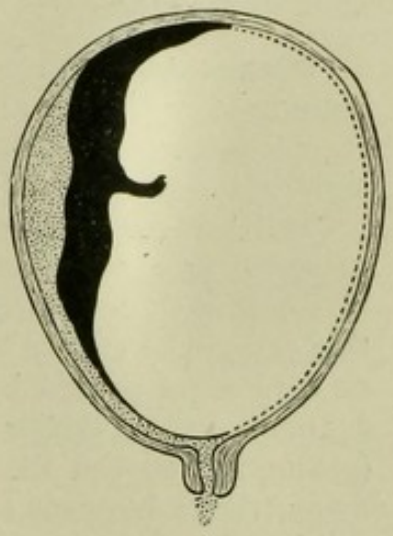

Fig. 277.—Accidental hæmorrhage ; the dotted area represents blood.

When the blood is thus retained there is more or less distension of the inert uterus. Marked symptoms will arise from this, and it is recorded that the distension has been sufficient to rupture the uterus.

Symptoms.—The bleeding comes on during the last weeks of pregnancy in nearly all cases ; but of course there may be hæmorrhage beneath the placenta at any time after its formation. The earlier the bleeding happens the less characteristic are its symptoms and the more likely to be merged in those of abortion.

The quantity of blood lost varies, and in a large majority of cases is not of dangerous amount. It may, however, be so extensive as to call for immediate treatment to save the woman's life.

The concealed variety is rare (about 1 in 100 of all cases of accidental hæmorrhage), but these cases are by far the most dangerous, for the bleeding goes on for some time unsuspected by the woman, who, if the detachment of placenta is at all extensive, soon suffers from the effects of *internal hæmorrhage*, and in a very marked degree from those of *shock* due to uterine distension. She feels severe pain over the uterus, with the sensation of abdominal distension. There may or may not be a history throwing some light on the nature of the case. She has all the signs of collapse and of severe loss of blood, the uterus is found tightly distended and tender to the touch, and there is an absence of contraction and relaxation.

In slight cases these symptoms are present in a lesser degree; in severe ones the signs of hæmorrhage and, in the concealed kind especially, of shock, become more marked, and death may take place, ushered in by convulsions, loss of sight, and intense dyspnœa.

Prognosis.—The mortality of accidental hæmorrhage, taking all cases together, is computed to be about 10 per cent. It is probable that this is a high estimate. for no doubt a large number of slight cases remain unrecorded. In the concealed kind about 50 per cent. of the mothers and 90 to 95 per cent. of the children die.

Inertia uteri during labour, and from this cause, post-partum hæmorrhage after delivery, is very apt to occur owing to the collapse, the over-distended condition of the organ, and often, no doubt, to the originally unhealthy state of the uterus.

Diagnosis.—The condition most likely to be confused with accidental hæmorrhage, if blood appears externally, is *placenta prævia*. Other hæmorrhages are at once excluded by a careful examination by touch and sight of the genital tract.

If the finger can be passed through the internal os, the question of the presence or absence of a placenta there may be at once settled. But bleeding often occurs before the cervix is wide enough to admit a finger. In this case, if by steady but gentle pressure upwards for a time, the internal os cannot be passed by the finger,[1] it may be possible to make out, by examining the anterior vaginal and uterine walls, if there is any structure (placenta) between the head and the anterior uterine wall. If accidental hæmorrhage happens as late as it usually does, the absence of ballottement will be of no help, but before the seventh month this sign will be obtainable if the placenta does not intervene between the head and finger. A clot might give rise to the same sensations as a placenta if felt through the vaginal or uterine walls. The diagnosis is obscured also if the lie is not cephalic. The history is of some value if quite definite—that is, if the bleeding has come on shortly, not necessarily immediately, after one of the accidents enumerated, and if it has never happened before in the pregnancy. A history of shock followed by hæmorrhage is not conclusive, as a shock may, and probably often does, bring about bleeding from a placenta prævia, by causing partial detachment of the placenta. The absence of such a history, moreover, as we have already seen, does not by any means exclude accidental hæmorrhage. In fact, the only reliable sign is the absence of placenta from over the internal os.

If the blood is mainly retained in utero, the signs of internal bleeding and shock have to be distinguished from the same signs in cases of *rupture of the uterus* (p. 489), or of ruptured *ectopic gestation* (p. 324).

Rupture of the uterus before labour has obviously begun is an extremely rare event. If it did occur it would resemble accidental hæmorrhage in its main symptoms, but on examining the woman's abdomen the uterus in the case of rupture would be found to be smaller than would correspond to the date of pregnancy, owing to escape of the liquor amnii, and possibly the

[1] Accidental hæmorrhage is rare in primigravidæ, and in multiparæ the os can usually be dilated by the finger.

fœtus, through the rent. The fœtus might be felt in the abdomen as a mass distinct from the uterus. The symptoms of rupture after labour has begun are very characteristic, and will be described in their proper place.

Treatment.—The bleeding from the placental site cannot be arrested, if any but very small vessels are torn, as long as the uterus is prevented by its contents from contracting and retracting. The obvious principle on which treatment must be based, therefore, is to empty it. This can be begun at once, and completed in a short time.

In the slighter cases, where the bleeding is not serious and there is no symptom of collapse, it is right to try the effect of rest and absolute quiet, and the administration of sedatives—opium being the best, in moderate doses. By these means the uterus may be quieted down, and the blood will then clot where it lies, without being forced by uterine contractions under the adjacent portions of placenta, thus tearing fresh vessels and causing increased bleeding. The patient, supposing she is less than seven months pregnant, may be enabled to have a living child or even to go to term.

If the case is severe and immediate action is necessary, it is to be remembered that the uterus is nearly always inert, certainly so if the hæmorrhage is concealed, and an assistant should, if possible, be ready to compress the flaccid organ as its contents are evacuated. If there is no possible obstruction present to a speedy labour, a dose of ergot may be given and repeated once or twice if it is appearing to do good.

A binder (p. 229) should be very carefully adjusted ready to be tightened if no skilled assistance can be obtained.

When these arrangements have been made the membranes must be ruptured or punctured.

Rupture may be accomplished by means of the finger-nail or by the sound, care being taken that all instruments used are aseptic.

If the os is dilated this is easy.

If the os is undilated the diagnosis of the nature of the bleeding cannot, as just stated, be made with certainty.

It may be possible to pass the tip of the finger through the internal os by gentle pressure, and this must always be attempted ; for since most women suffering from this accident are, as already said, multiparæ, and so have a cervix which is pretty freely open as far as the internal os, a little pressure will be enough to enable the finger to reach the presenting part of the ovum. If digital pressure will not effect dilatation, either because the woman is a primipara, or because the os is too resistant, it is best to dilate the cervix with Hegar's dilators to a diameter which will admit the finger, or in the absence of Hegar's dilators a sponge-tent may be inserted, and careful watch kept for evidence of concealed hæmorrhage. If the uterus begins to distend, and the woman to show signs of fresh loss of blood, it wil be obvious that the case is one of accidental hæmorrhage which the tent has converted into the concealed variety ; and upon this a sound may be passed and the membranes ruptured or punctured without delay. If the case is one of placenta prævia, the tent will have been the best possible treatment under the circumstances.

After dilatation by any of these means the membranes are to be ruptured.

In an extremely urgent case, if no dilating instruments are at hand, and the internal os cannot be passed by the finger, an attempt must be made to rupture the membranes with a sound. If when the sound has passed the internal os it is felt to go through membrane suddenly, and liquor amnii is discharged, the case is one of accidental hæmorrhage in all probability ; and if the uterus now contracts on the fœtus, and there are no more signs of bleeding, the labour may take its course, help in dilatation and expulsion being given according to ordinary principles. If when the sound has passed the internal os a sensation of placental tissue is felt, the vagina should be plugged for a few hours if no sponge-tent or other dilator can be obtained.

It is better not to puncture the membranes at their most bulging point for two reasons. First, it is a good plan to let the liquor amnii drain away somewhat slowly, so that the uterus may recover itself and follow the diminishing ovum down ; second, it is well to allow any blood pent up by adhesion of membranes around the internal os to escape.

To fulfil these conditions the sound should be introduced a little way between the membranes and the uterus, and then pushed through the former.

If inertia still prevail, or if the cervix after rupture of membranes be rigid, the os must be dilated by Hegar's dilators or digitally, and then some form of hydrostatic dilatation—Barnes' or Champetier de Ribes' bags—employed. The forceps should be used as soon as the size of the os permits, so as not to cause any further risk of exhaustion, or allow of more bleeding. During traction by the forceps the uterus must be well supported through the abdominal walls. In cases of great urgency, and before the cervix is dilated enough for the forceps, turning is the best treatment.

Where the child is dead, perforation, followed by extraction by means of the cephalotribe, gives the best chance of safety to the woman, and in extremely urgent danger threatening her, with a moderately dilated or easily dilatable os, perforation of a living child has been found necessary. For such straits as would necessitate destruction of the child it has been proposed to perform Porro's operation, but this seems unnecessarily severe treatment.

Post-partum hæmorrhage must be guarded against by careful supervision of the uterus during the whole process of labour and for some time after. Even when the uterus seems fairly well contracted, free oozing may go on for some time, and is, of course, dangerous in a patient already sufficiently bled. Ergot should in most cases be given in full doses, the pulse being carefully watched for any sign of cardiac failure, which ergot sometimes promotes. A hot intra-uterine douche (115° F.) should be used, and in some instances it might be well to plug the uterine cavity (see p. 354), and stop the bleeding entirely. Further, if the patient does not seem to be improving, and rallying from the hæmorrhage, the infusion of saline fluid (p. 360) would be highly advisable, and might be the means of saving her life.

Unavoidable Hæmorrhage. Placenta Prævia

Definition.—The placenta or some part of it is attached to the *lower uterine segment* (see p. 42), and some is of it necessarily detached during the expansion of this part in labour, owing to the limited elasticity of the placenta, and to the advance of the lower pole of the ovum which in this case is represented by placenta, and not membranes.

Causation and Frequency.—There is little known about the *cause* of this abnormality. Like accidental hæmorrhage, it is rare in primiparæ as compared with multiparæ, and it is said to occur more frequently in connection with subinvolution, and therefore with enlargement of the uterine cavity. It is not unlikely that in uteri whose walls, anterior and posterior, are not in apposition, and whose mucous membrane is unhealthy, the ovum might not make an attachment near the uterine end of the tube, but might fall down to the lowest point and adhere somewhere near the internal os. Its *frequency* is variously estimated, but it probably happens about 1 in 1,000 or 1 in 1,200 cases.

Anatomy. *Placenta.*—The placenta is nearly always thinner than normal, and at the same time larger in area. Placentæ succenturiatæ are common. These characters are due to the decidua being thinner near the internal os, and to the fact that the vascular arrangement of the lower uterine segment is less suited to supply the needs of a placental circulation.

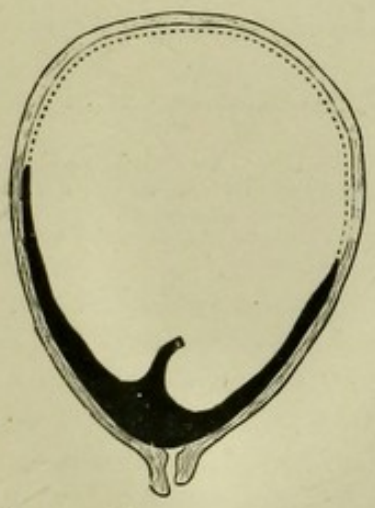

Fig. 278.—Placenta prævia, central

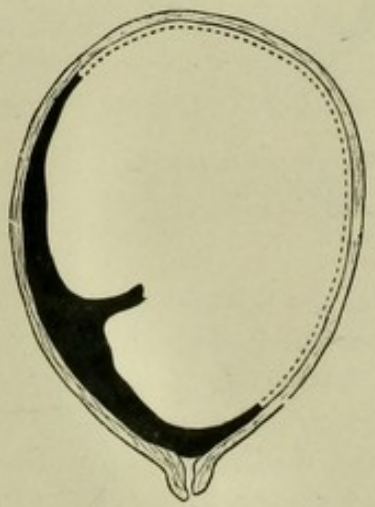

Fig. 279.—Placenta prævia, lateral.

Owing to the increased vascular supply over the placental area the lower segment does increase very much in thickness, and this thickening, as will be seen, has sometimes an important bearing on the progress of labour. Morbid adhesions and fibrous lumps are common, and are due to previous hæmorrhages and thromboses.

Site.—The placenta may be situated so that its centre corresponds or nearly so with the internal os, central insertion; or its edge may overlap the edge of the internal os, partial or lateral insertion; or some of its area may merely reach into the lower segment, as far as or nearly as far as the

edge of the internal os, marginal insertion (see figs. 278, 279, 280). As the internal os widens during labour it exposes more and more of the placenta in the lower segment, so that a placenta originally marginal may become, as dilation goes on, a laterally inserted one.

Besides this exposure of surface by widening of the os, it will be readily seen that the placenta must advance to some extent through the cervix during labour, since it takes the place of the membranes at their area of yielding.

The circular line which limits the lower or distending segment of the uterus lies at a distance of about three inches from the internal os at the beginning of labour, and indicates the level at which the calibre of the uterus is such as to allow the head to pass through it without stretching it to an appreciable extent.

It is easily seen that the uterine wall above this line need not, and in fact does not, stretch for the passage of the fœtus ; and so any part of the

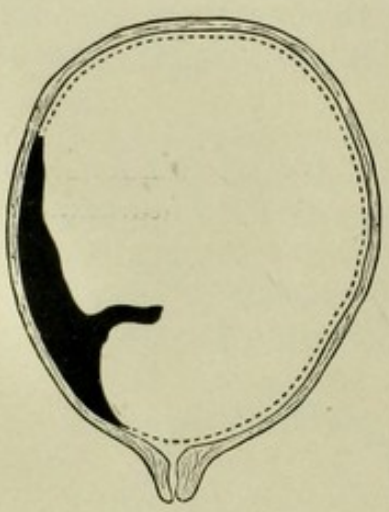

Fig. 280.—Placenta prævia, marginal.

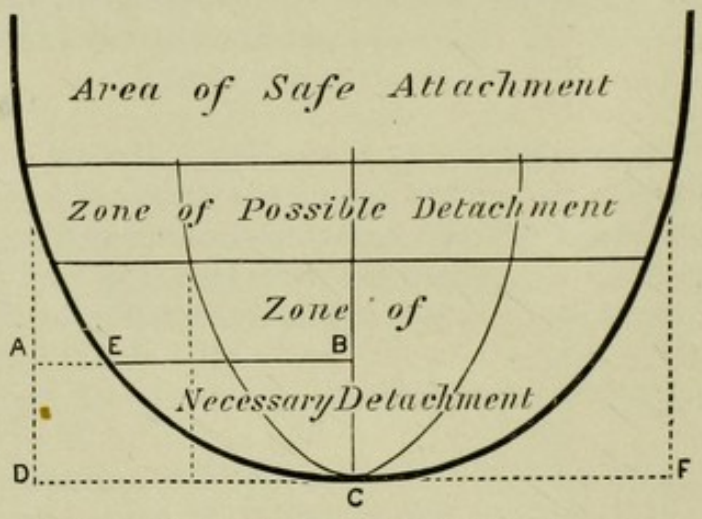

Fig. 281.—Placenta prævia. Inner surface of lower part of uterus. C, closed internal os. In full dilatation an area such as E C B has to expand to area of A D C B. D F represents diameter of head.

placenta (in normal cases of course the whole placenta) attached above it is not disturbed, since its site is not stretched. At the line, and for an inch or so below it (zone of possible detachment, fig. 281), there is slight stretching, and any part of the placenta seated on this zone may possibly be detached during labour. Below this zone, that is, within a distance of two inches from the internal os (zone of necessary detachment, fig. 281), detachment unavoidably occurs as the os dilates for the head to pass.[1]

Source of Blood.—The blood shed is practically all maternal, for the separation occurs as usual through the ampullary layer. A small quantity comes from the under surface of the placenta as it is detached, but the greater part by far from the torn sinuses and vessels on the uterine wall. The reason so little comes from the placental surface is that the circulation

[1] This line must not be confused with the 'contraction' or 'retraction' ring (see p. 98). The real nature of this last is not yet settled, and although it no doubt indicates the line of division between the contractile and distensible segments of the uterus, and corresponds with the limit of firm attachment of uterine peritoneum—a definite limit—it will be remembered that this ring is steadily moving away during labour from the os towards the

in the placenta is very slow, and thrombosis easily takes place. The detached part has to be supplied with blood through the unruptured vessels of the part still attached, and in its very slow journey through these sinuses the blood clots (fig. 282). The bleeding is very free, since the uterine wall cannot contract, and if a large area of placental site is laid bare before assistance is obtained the woman may bleed to death.

If the placental site is stretched considerably, the bleeding from it is arrested, for the stretching obliterates the vessels. The stretching agent, the fœtal head or breech, acts by its direct pressure also to the same purpose.

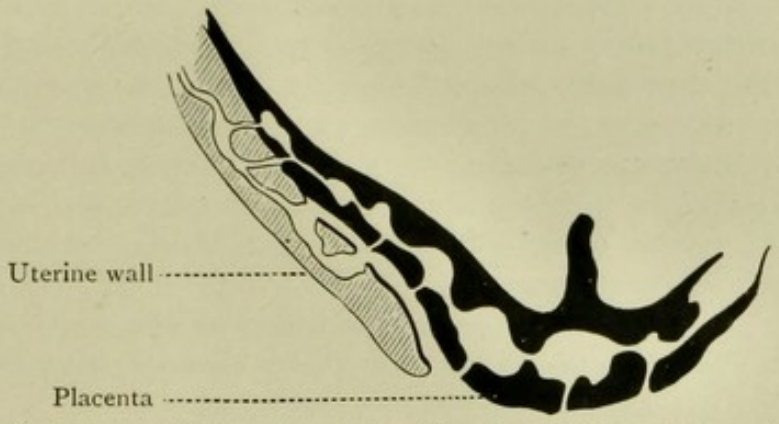

Fig. 282.—Detachment of placenta prævia. The placenta is seen to be partially detached, and the only blood supply to the sinuses is through those still remaining in communication with the vessels in the uterine wall. The sinuses in the detached part being thrombosed, no bleeding can occur from their cavities.

Hæmorrhage before labour.—Hæmorrhage sometimes begins before labour has set in, or at all events before actual pains are experienced. This is almost always due to detachment by shock of some kind, and is produced in the same manner as accidental hæmorrhage. The placenta is more liable to detachment when prævia. Detachment has been known to be caused by coitus. Signs of old hæmorrhage, fibrous masses, and adhesions are very often found.

This early bleeding has been accounted for in other ways. It has been considered to be due to slight dilation of the cervix, such as is believed by some to occasionally occur during the latter months (see p. 45) ; by others (Barnes) to the placenta growing more rapidly than the lower uterine segment (it has

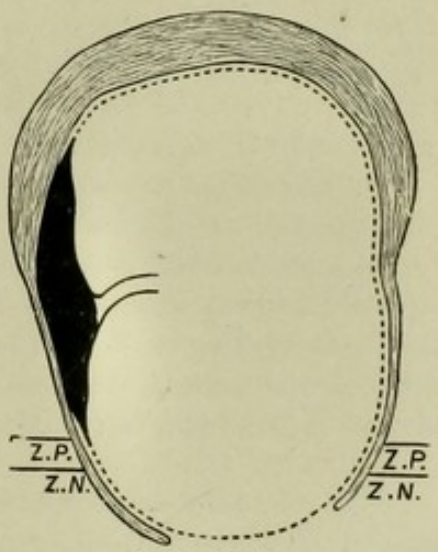

Fig. 283.—*Z P*, zone of possible detachment ; *Z N*, zone of necessary detachment. The retraction ring is seen to have retreated above the level of the zone of possible detachment.

fundus, and will not therefore coincide permanently with the circle 3 inches from the internal os just mentioned. It will, in fact, beginning quite below, in a very prolonged labour, retreat higher than a circle thus drawn (fig. 283). It is, however, true that all the uterine wall below this line is being stretched by the ovum (p. 409), and that any part of the placenta on the stretched area will be detached. So that in a prolonged labour the retraction-ring no doubt carries up with it this upper boundary of the zone of necessary detachments. The relation of the retraction-ring to the process of labour in placenta prævia was indicated by Barnes, though he did not describe the anatomy and physiology of the production of the ring.

been stated on p. 341 that the placenta, when it is prævia, is larger in area than normal).

Symptoms, Signs, and Course.—Very few cases of placenta prævia go to term, for the early separation often starts the process of labour by causing irritation at the internal os ; or possibly the sudden anæmia may do so ; or medical aid is called in, and the physician induces labour. Bleeding due to placenta prævia is commonest at and after the seventh month, and though instances of bleeding before this do happen, such early hæmorrhage usually turns out to be caused by a threatened abortion.

Bleeding is the characteristic sign, and it is usually sudden and profuse. It is sometimes fatal, especially where it occurs in the last week or so of pregnancy. It may, however, be a continuous oozing, or there may be a slight loss, and then complete cessation for a time. It may, and often does, come on while the patient is in bed and asleep ; or it may appear while she is up and about, possibly during or after some exertion.

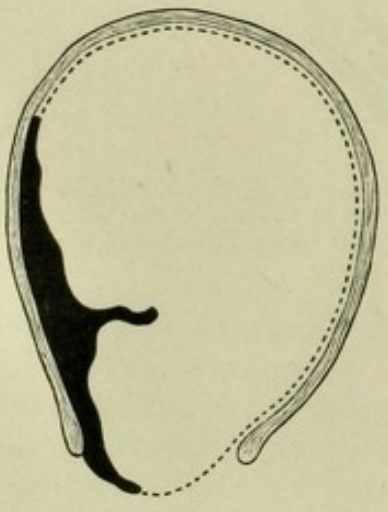

Fig. 284.—Placenta prævia entirely detached from one side of the lower segment, and allowing its membranes to bulge.

The bleeding is found to begin earlier when the placenta is centrally situated than when it is lateral.

When hæmorrhage has begun in earnest and goes on steadily, the result to the patient depends almost entirely on the active condition of the uterus. If this is inert the bleeding remains unchecked, and will most probably end fatally ; but if the uterus is acting well, and the placenta is not centrally situated, the bleeding may be spontaneously arrested ; for where only a small part of placenta is attached on one side of the os, it usually follows the main mass across this opening during dilation (fig. 284), and the membranes can protrude and rupture, allowing the presenting part of the child to descend and compress the bleeding area.

Hæmorrhage occurs during the separation of the placenta from the area of necessary detachment only, and ceases when this is completed.

In a few recorded cases, total separation of the placenta, when it has been situated centrally or nearly so, has occurred, and it has been expelled before the fœtus. The child has nearly always been dead by the time it was born, but in one or two remarkable instances, presumably with a very active uterus, it has been born alive.

We may now consider the effect of placenta prævia on labour, pregnancy, and the lying-in period.

Effect on pregnancy.—The occupation of the lower end of the uterine cavity by the mass of the placenta interferes to some extent with the fœtal lie, by preventing the head from fitting into this part. The presentation is therefore often abnormal. Unusual lies are more probable on account also of the prematurity of labour prevailing in cases of placenta prævia.

Effect on labour.—The course of labour, apart from hæmorrhage, is

usually considerably modified. The pains, unfortunately, are nearly always very weak. This is due to several causes, of which the most important are (1) loss of blood, and (2) rigidity of cervix and lower uterine segment owing to their thickened condition. This rigidity interferes with polarity, which is further disturbed by (3) the absence of dilatation of the os by the membranes.

If there is any malpresentation it will interfere with the course of labour in a manner corresponding to its nature. Prolapse of the cord is not uncommon.

Owing to the uterine inertia the woman is very liable to post-partum hæmorrhage, which thus arises under particularly unfavourable conditions. Supposing this danger averted, the woman may die from loss of blood within one or two hours of the completion of labour, falling into a state of syncope which is unrelieved by ordinary stimulants.

Finally, a woman may be killed by air entering the uterine veins, and causing air-embolism during separation of the placenta (see p. 555).

Effect on the lying-in period.—The patient is very liable to septicæmia for the following reasons: (1) In the management of cases of placenta prævia there is necessarily much manipulation of the cervix and lower uterine segment during labour, and therefore increased risk of septic contamination. (2) Owing to the low situation of the placental site it is very liable to septic infection from hands and instruments during labour, and from its nearness to the germ-containing cervix and vagina during the lochial period. (3) The exhaustion and anæmia nearly always present diminish the patient's power of resistance to septic organisms. (4) A placenta succenturiata may be left behind.

The septicæmia may take any one of its forms (see p. 525). Phlegmasia alba dolens is a form of sepsis which may occur.

Other remote but possible results of the anæmia are insanity and pulmonary and other thromboses.

Diagnosis.—The diagnosis of placenta prævia cannot be made with any approach to certainty until the placenta has actually been felt by the finger to lie in the lower uterine segment. It cannot therefore be made until the cervix is sufficiently dilated to allow the finger to pass. It is true that the only other condition which is likely to be confused with it at the late period of pregnancy at which it usually occurs is accidental hæmorrhage, but before the cervix is dilated to the extent mentioned there is no reliable means by which to distinguish between these two forms of bleeding.

In the case of placenta prævia the finger will find covering the internal os, if the insertion is central, the unmistakable texture of placental tissue; in lateral and marginal insertions the membranes will partly or entirely cover the orifice, and in the latter the finger may have to be passed an inch or more inside the uterine cavity to feel the placenta.

Placenta prævia is *suggested* by (1) the history of the onset of the bleeding, though, as has been noted, this will not take us very far, for hæmorrhage, where the placenta is prævia, is liable to happen sometimes after a fall or shock, and accidental hæmorrhage may come on in the absence of any such disturbance.

(2) If by abdominal examination the fœtus is found to be in the cephalic

lie, it is very likely that on examining per vaginam there will be felt to be a thickish layer of tissue between the examining finger and the head resting on the anterior uterine wall in front of the cervix. In a few cases of placenta prævia it has been made out on abdominal examination that a mass, which afterwards was proved to be placenta, was lying on the front wall of the lower uterine segment.[1]

The diagnosis is not often to be established by these signs. It requires some practice in such examinations to be able to form an opinion of any value from palpation of the placenta through the uterine and abdominal walls, and then, too, the placenta in these cases is, as a rule, thin and not readily felt.

The occurrence of gushes of blood during the pains or between the pains is of no value in distinguishing placenta prævia on the one hand from accidental hæmorrhage on the other, for the blood in each case must collect in the vagina, and it may be expelled thence at any moment quite independently of the moment at which it was effused.

Concealed accidental hæmorrhage is not likely to be confused with placenta prævia: there is little or no external blood loss in the former, and no distension of uterus in the latter.

It may be said also that if the placenta can be made out by abdominal palpation to lie on the upper part of the uterine wall the case is not one of placenta prævia, unless twins are present, when there may be a placenta over the os as well.

Treatment.—If hæmorrhage occurs to a woman during the later months of pregnancy, and a diagnosis between the two kinds of bleeding cannot at once be made, the case must be treated as is recommended for doubtful cases under accidental hæmorrhage on p. 339.

If, however, a diagnosis of placenta prævia can be made at the time of the first bleeding, it becomes a question whether the case should be temporised with or be brought to a termination at once. It is recommended by some authorities that when the fœtus is as yet not viable, an attempt should be made to carry the pregnancy on to the time of viability of childhood if the loss is not very great. It has been mentioned that the bleeding begins earlier the more central the attachment of the placenta, and so, when bleeding begins before the seventh month, it is very probable that the site is in its more dangerous position. The child, as will be seen immediately, is under these circumstances unlikely to be born alive, and to temporise is to expose the mother to greatly increased risk to try to save a child whose chance of surviving its birth is very small. This is quite contrary to accepted principles; and, moreover, the difficulty of rearing a premature child has to be considered, for when once placenta prævia is diagnosed no one would allow the pregnancy to go beyond the seventh month. It may be laid down then as a general rule that *as soon as placenta prævia is diagnosed the uterus should be emptied;* for if the child is viable there is no reason against, but every reason for, doing so, and if it is not viable there is little chance of its being delivered alive.

When a diagnosis of placenta prævia has been made, the woman should

[1] Spencer, *Obst. Trans.* vol. xxxi. p. 203.

not be left for any long time until delivery is complete. If the case be one which has not reached the seventh month, the cervix must, if necessary, be dilated by a sponge-tent (see p. 356), and the first two fingers must then be pushed past the placenta or through the membranes, so that the presenting part of the fœtus can be got at. Supposing it is the breech, the foot must be brought through the cervix and drawn down until the half-breech plugs the canal; if the head or other part of the child presents, bi-polar version must be performed.

It very often happens that after the tent has dilated the os to some extent the uterus begins to act well, and expels the ovum without much more bleeding.

If the woman has reached the seventh month, the line of treatment depends on (*a*) the activity of the uterus, (*b*) the situation of the placenta.

With an active uterus and a *lateral or marginal placenta* there is need for little or no anxiety about the result. All that is necessary is to rupture the membranes at the most accessible point. The head or breech takes the place of the presenting membranes or edge of placenta, and no more forward movement of these last is necessary, and thus one cause of bleeding is eliminated. More important than this, the presenting part is likely to come down into the cervical canal and check the bleeding entirely.[1]

If the placenta is thus favourably inserted, but the uterus is not acting well, the forceps should be applied to the presenting head, and ergot given (½ drachm of tr. ergot ammon. twice) if there is no obstruction to the advance of the fœtus. The uterus must be carefully supported during extraction, so as to ensure its following the ovum down and retracting properly. Great care is to be taken in applying the forceps not to include any part of the placenta between the fœtal head and one of the blades. If the breech presents, one foot should be brought down through the cervix, and the half-breech pulled into the opening. Labour will then go on without further hæmorrhage as a rule, but if there is any bleeding, firm traction on the foot will stop it at once (fig. 286).

When the placenta is *centrally, or nearly centrally*, inserted the case is very dangerous. Activity or inertia of the uterus are now alternatives which greatly influence the fate of the woman, and (in a much lesser degree) that of the child. Even with an active uterus there is a very small chance of delivering a living child, for when the only possible spontaneous method of delivery—that of the whole placenta first and then the child—takes place, it is a most exceptional event for the latter to be born alive, and, even when the measures about to be recommended are carried out, it is acknowledged that the child's chance is not a good one (the mortality is about 90 per cent.).

Practically the result of the case now depends almost entirely on the treatment. What this should be to start with is decided by the state of the cervix—whether dilated enough to allow of the introduction of two fingers so as to do bipolar version or not. When dilatation has been produced, the

[1] Where a large number of placentæ are systematically examined, the insertion of the placenta is found in a certain small proportion of cases to have been partly in the dangerous area without having given rise to marked bleeding, or at least to bleeding sufficient to need treatment or to suggest a placenta prævia.

case is handled as if there had been sufficient dilatation when the first examination was made.

Dilatation enough to admit one finger is necessary before a diagnosis can be made, so we may assume that treatment has advanced so far.

(The details of the method of dilating with tents are described in the chapter on Obstetric Operations (p. 356). *Sponge tents* are the most suitable of any for the cases now under consideration, because they expand more quickly than any other kind, and, owing to their texture, they probably check the bleeding better than the tents of laminaria or tupelo, which are smooth. They dilate evenly, and without the force which the fingers, when used for this purpose, are liable to exercise, and they do not involve frequent manipulations. It is very likely that their constant action stimulates the uterus more perfectly than the intermittent stretching caused by most other means.)

It can now be carried on by means of the fingers, by inserting two, three, or more sponge tents into the cervix, by Hegar's dilators, by hydrostatic pressure, or by plugging the vagina.

Although tents may be used to continue the dilatation after it is possible to introduce a finger, it is better then to go on with some instrument which does its work more rapidly.

By using *Hegar's dilators* the os can be rapidly stretched, but their employment necessitates frequent introductions of fresh instruments into the cervix, and increases the woman's risk by making septic infection more possible. Moreover, unless a special set of large size be used, the os cannot be sufficiently dilated ; and, lastly, they form a very considerable addition to the bulk and weight of the midwifery bag.

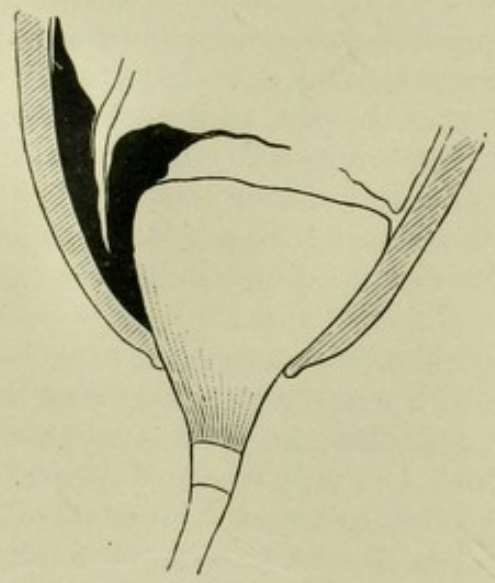

Fig. 285.—De Ribes' bag applied to placenta prævia.

There are two kinds of hydrostatic dilators—*Barnes's bags* and the bag of *Champetier de Ribes* already mentioned—and a description of them both will be found in the chapters on Obstetric Operations (p. 358).

Since Barnes's bags need changing at least once or twice, and the other kind is not changed at all ; and as, owing to the shape of De Ribes' bag, it compresses not only the sides of the cervix (fig. 285), but also the surface of the uterine wall for one or two inches, depending on the amount of dilation existing at the time, and checks the bleeding in this way more completely, the latter instrument, or one like it, will be found the best thing to use in these cases.

Digital stretching is very good in the absence of any instrumental aid ; and *plugging the vagina* (see p. 353) is a means of stimulating the uterus which may be employed by a nurse with advantage pending the arrival of the medical man, or by him as a temporary measure if the os is still undilated and he has no other means of effecting this.

Before describing the steps of the procedure to be now adopted there is

one manœuvre to be mentioned—that is, the separation of the placenta over a certain area round the internal os. Barnes attaches great importance to this as a means of stopping, or, at all events, of greatly diminishing, the bleeding which occurs as the os and lower segment dilate. It no doubt does diminish the bleeding from the placenta directly, for it enables thrombosis to take place at once in that part which is separated, as shown in the diagram (fig. 282).

A more important result, however, is the opportunity which the detachment of placenta round the internal os gives to the ovum to advance ; just as sometimes when there is delay in the formation of a bag of membranes in an otherwise normal labour owing to excessive adhesion of the chorion round the os, this may be rectified by passing the finger between the uterine wall and the membranes for a short distance round inside the os.

This small manœuvre can be carried out as soon as the os will admit a finger. The finger should be introduced as far as the second joint, and then swept round under the placenta in a circle, of which it forms roughly the radius. The placenta will be separated over a circular area of about 5 inches in diameter, corresponding roughly to what has been mentioned as the area or zone of necessary detachment ; if the os is somewhat dilated, its diameter will be added to the 5 inches. Thus if the finger reaches 2½ inches from the edge, and the os is 1 inch wide, the diameter of the area separated is 6 inches. If the placenta were quite central, this area would represent more than half the placental surface ; but this situation is very rare, and there is, as a rule, enough placenta left attached to carry on the fœtal circulation adequately.

We have considered the treatment fully as far as dilating the cervix up to a degree large enough to admit the finger. If the dilatation has reached this stage when the patient is first seen, treatment can be commenced at this point.

The first thing to do is to *separate the placenta* in the way just described. In doing this it will be noticed how near the nearest edge of the membranes is to the os.

Next a *hydrostatic dilator is inserted* and expanded. In the case of Barnes's bags the smallest size is used, and when it has done its work, which will be in a few minutes to a quarter of an hour, it will be found on withdrawing it that two fingers can be passed without difficulty.

If the membranes have been reached and identified, the point to make for is known, and with the two fingers acting on the fœtus at this point, and the other hand external, *bipolar version* (p. 367) is now to be performed. Perforation of the placenta by the finger so as to reach the fœtus is very rarely necessary, and is not always easy, but if no margin can be found it must be done. Fortunately, the placenta is usually thin. The membranes are ruptured, a foot is brought down and caught by the fingers, and drawn through the cervix as far as it will come without more than slight force being used. The half breech now acts as a perfect plug (fig. 286).

The woman is usually safe for the present, and the completion of labour should be left to nature, unless there is considerable uterine inertia, for which a careful watch should be kept. When the uterus is inert, the leg

must be pulled upon and used to extract the child, ergot and firm abdominal support being employed.

The separation of the placenta and the slow delivery by the breech give, as has been already said, small chance of survival to the child, and on this account *Champetier de Ribes' bag* (p. 359) will probably, after an extended trial, be found a better mode of treatment than turning. It can be inserted as soon as the smallest-sized Barnes's bag, and left in the uterus, where it will act as a complete plug until it has dilated the os to a sufficient size to allow of delivery of the child by the natural forces, or by the aid of forceps if necessary. The dangers of slow delivery by the breech are thus averted, and there is, if anything, less risk to the mother, since the manipulations necessary for turning are avoided.

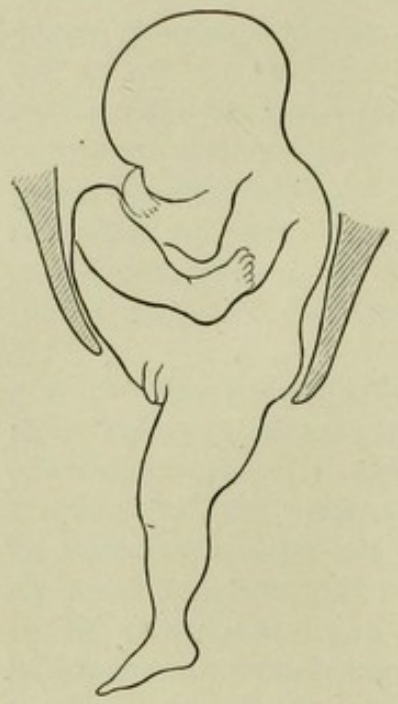

Fig. 286.—Wedge formed by child in half-breech attitude.

Supposing it is found impossible to do bipolar version at the stage recommended, the cervix must be further dilated so as to allow of the introduction of the hand inside the uterus to seek a foot. This dilatation may be necessary if Barnes's bags are used; but if the French dilator be used, the further danger arising from this severer operation is nearly always obviated.

On account of the tendency of the woman, if her strength is drained by bleeding, to post-partum hæmorrhage, great care should be taken to ensure complete retraction, and a close watch must be kept on her for some hours after delivery to prevent this.

When the labour is over and all bleeding has stopped, if the patient has lost considerably during and before delivery, she may fall into a syncope, and sometimes die. If there seems from the woman's aspect and physical state any likelihood of this, she must be well supported with stimulants, her head kept low, external warmth maintained by hot bottles and blankets, and the injection of saline fluid resorted to at once, three or four pints being slowly run into the veins (see p. 360).

The observance of strict antiseptic principles throughout the whole process of labour and period of lying-in is essential.

TREATMENT OF HÆMORRHAGES IN LATER MONTHS OF PREGNANCY

ACCIDENTAL HÆMORRHAGE (when a certain diagnosis is made by passing the finger through the internal os).

The internal os is therefore dilated to a size admitting the finger.

1. **Hæmorrhage Slight.**—Rest, sedatives, &c.
2. **Hæmorrhage Moderate.**—Ergot, binder, puncture of membranes.
3. **Hæmorrhage Severe.**—Same as last, and forceps, version, perforation according to urgency.

PLACENTA PRÆVIA (when a certain diagnosis is made by passing the finger through the internal os.)

The internal os is therefore dilated enough to admit the finger.

Bring on labour as soon as the case is diagnosed.

1. **Placenta Central.**—*Separate placenta* round os, insert de Ribes bag, or dilate the os as much as necessary for turning by bipolar method or if this is impossible, by internal method, and *turn*. Extract slowly.
2. **Placenta Marginal or Lateral.**—Rupture the membranes, and if the head does not come down, apply the forceps or turn.

Note.—Dilate with Hegar, sponge-tent, and then with Barnes's bags, or Champetier de Ribes' bag. With the last, turning may not be needed.

ACCIDENTAL HÆMORRHAGE or PLACENTA PRÆVIA (diagnosis is not clear).

The internal os is therefore undilated, and the finger cannot pass.

1. **If the bleeding is slight**, rest, &c., as in slight Accidental Hæmorrhage.
2. **If the case is at all urgent, or if bleeding recurs**, one of the following alternatives :
   - (*a*) Try to pass finger by moderate pressure, and diagnose.
   - (*b*) If this is impossible, use Hegar's dilators if they are available.
   - (*c*) In their absence insert a sponge-tent, carefully watching so as to interfere if the uterus becomes distended. (If this occurs the case is one of accidental hæmorrhage, and can be at once treated.)
   - (*d*) If the case is urgent, and no dilating instruments or tents are obtainable, pass a sound, and try to rupture the membranes. Then, if the liquor amnii is discharged, the case is accidental hæmorrhage ; if no liquor amnii appears, and there is a sensation as of placenta felt, plug the vagina for six or eight hours, and then pass the finger and diagnose.

OBSTETRIC OPERATIONS

CHAPTER XLVII

GENERAL CONSIDERATIONS

IT is better to take these operations in a separate section, so that they may be easily referred to when necessary during the description of the treatment of the various conditions which require them. Each one will be described as far as possible under the following headings :—

Definition of the operation.
Purpose of the operation.
Conditions requiring it.
Instruments employed.
Method of performance.
Advantages and disadvantages in comparison with other operations.[1]

It is most important to remember in all cases how much can be done by the hands alone before resorting to instruments. There is less danger to the mother and child in using the hand, for the educated tip of the finger enables the operator to know exactly where it is going, and what it is doing ; comparatively little damage can be done to the tissues with it ; and the fewer the instruments passed into the genital passages the less is the danger of sepsis.

The patient, the operator's hands, and all instruments are to be made aseptic in every case. The best way of doing this in the case of the first two has been described in the chapter on the Management of Labour, and the instruments are best cleansed by boiling them, and then, before use, placing them in a 1–20 solution of carbolic acid. Practically every instrument can be made entirely of metal or other material, that may be boiled, and can be arranged to take to pieces in such a way that no part of it is inaccessible.[2]

For the success of operations which involve opening the peritoneum, as Cæsarian section ; or making large wounds, as in symphysiotomy, the surroundings of the patient are of very great importance ; and unless under

[1] Many of the operations can be practised with an ordinary pelvis and dead fœtus or dummy ; but to do some, for instance, version, in anything like the way resembling that employed in actual practice, a rather elaborate phantom, such as that of Budin or of Schultze, must be used.

[2] For the best way of making surgical and other instruments aseptic, see Schimmelbusch, English translation by A. T. Raike, *On the Aseptic Treatment of Wounds.*

circumstances of urgency, such operations should not be performed in the insanitary homes of the poorer classes. In these cases the alternative operations which involve the death of the child, but which do not bring so much risk to the mother, must be adopted.

As part of the preparation for all operations, the bladder and, if there is time, the rectum must be emptied.

Anæsthesia is nearly always desirable, and in some cases necessary ; and in the latter case an assistant to administer the anæsthetic is always an advantage. There are, however, some of the operations which will here be classed as major, at which it is quite usual and not objectionable for the operator to give the anæsthetic himself, in the manner described in the chapter on Anæsthetics (p. 205).

The position of the woman varies according as the operation is done per vaginam or involves opening the abdomen or the pubic joint ; but in all operations through the vagina the usual left lateral position is the most convenient (see p. 186).

The operations of Midwifery may for convenience be divided into two groups : one of which includes the introduction of premature labour ; version ; the use of the forceps ; the use of the vectis ; and those procedures by which the diameters of the fœtus are reduced, namely, craniotomy, with the various procedures for extraction after the skull has been perforated ; and embryotomy, including decapitation, evisceration, &c. ; also operations on the mother for the sake of delivering a living child, namely, Cæsarian section, simple, or with Porro's modification ; and symphysiotomy ; and abdominal section for the purpose of sewing up a ruptured uterus. The transfusion of saline fluid may be considered in this group. The above may be called Major Operations.

The Minor Operations are : Plugging the uterus and the vagina ; artificial dilatation of the genital passages ; suturing vaginal and other tears ; extraction of the after-coming head ; expression of the fœtus ; removal of the placenta when its delivery is delayed.

Some of these last have been treated of in the place where the conditions requiring them are discussed, and the others are here considered.

Plugging the Vagina

Definition.—This consists in filling the vagina with some material, such as a water- or air-bag, lint, gauze, cotton wool, &c. The vagina must be completely filled, for plugging the lower orifice is of no use ; and the first-introduced portion of stuff, or the fundus of the bag, must be passed up to the vaginal fornices, particularly the posterior fornix.

Purpose and Scope of the Operation.—Two results are obtained by plugging the vagina. The uterus is stimulated by the presence of a foreign body in the genital passage, and contracts, the cervix, in agreement with the law of polarity, dilating at the same time. The plug also acts mechanically in arresting the bleeding. The former is the more important result, but as a rule both are needed. The latter action is maintained for a time ; but since the vagina is contractile it compresses the plug, if made of compressible

stuff; and, unless it is elastic, as a water or air-bag is, the plug lies loosely in the vagina when the latter relaxes again.

Conditions requiring vaginal plugging.—First, *to arrest uterine hæmorrhage*; (*a*) in the case of inevitable abortion. Here its stimulating action on the uterus is especially useful, for it thus leads to expulsion of the ovum. Plugging may be safely used where the uterus is not enlarged to more than the size attained at the fourth month of pregnancy, for the uterus up to that time cannot contain enough blood to deplete the woman seriously (unless she has already lost a dangerous amount). The same combination of arrest of bleeding and stimulation of the uterus serves in (*b*) placenta prævia. The part pressed on by the plug here is the cervix and some of the bleeding lower segment. Second, *to induce labour*, or to accelerate uterine action in cases of inertia. It is, however, a practically obsolete method of doing this. Third, *to fix a tent*, which has been inserted into the cervix, and to reinforce its action; fourth, as a *completion of the operation of plugging the uterus*; and fifth, to *check bleeding from tears* of the cervix and vagina.

Instruments.—As a rule, unless the vaginal orifice is patent and the woman anæsthetised, a speculum is required. Sims' is the best instrument, because it opens out the fornices. Fergusson's is not so good, since the plug can through it be introduced up to the cervix only, and not well behind and around it.

The material for the plug may be of lint in strips; pledgets of absorbent cotton; gauze in rolls; or strips of linen or cotton stuff of any description. The material must be rendered sterile by boiling, or impregnated with a reliable antiseptic. Water or air-bags are not so good as the materials just named, because they do not fill the fornices. A pair of uterine or long dressing-forceps is useful, though not necessary.

Method of Use.—The vagina must be made as aseptic as possible, the woman lying on the side or in the semi-prone position. The Sims speculum is then introduced and held by an assistant, and the tips of the first and second fingers passed into the posterior fornix. A small bunch of the stuff is now carried up in the forceps to the finger-ends, seized by the fingers, and packed into the extreme angle of the fornix. If possible, some of the material should be passed into the cervix. Further bunches are placed in the same way, as tightly as possible, and the vagina thus filled; the packing down towards the lower end of the vagina need not be so tight as above: it is painful, and is only of use to support the upper part of the plug. A T-bandage may be applied if it seems necessary. The plug may under ordinary circumstances be left for six to eight hours.

Advantages in comparison with other Operations.—Plugging is inferior to a *tent placed in the cervix*, for this will do all that a plug does, and more; except in wounds of the cervix, in some cases of which plugging is necessary (see p. 494). Tents are, however, not always available.

Plugging the Uterus

This means plugging the body of the uterus. Plugging the cervix, which is best done with tents, is described immediately.

Purpose and Scope of the Operation.—The object is almost invariably to arrest post-partum hæmorrhage, but the body of the uterus has been filled with iodoform gauze for the purpose of making a septic uterus clean.[1] It is only within the last five or six years that the operation has been systematically used by anyone. The effect of the plug is to stimulate an inert uterus by the direct contact of the foreign matter with its interior; and to act also as a mechanical compressant, and as material on which coagulation will readily take place. The first-named action is the more important.

Conditions requiring it.—Its place in the methods adopted for arresting post-partum hæmorrhage is shown in the chapter dealing with that subject (p. 480). It would hardly be used by anyone now for making the uterus aseptic, as there are better means available.

Instruments Employed.—The materials for the plug are the same as those used in vaginal plugging. A long pair of uterine forceps is required, of length sufficient to reach the fundus uteri while the bows are in the vagina. It is a good thing to sprinkle iodoform or aristol, or some antiseptic powder on the plug as it is being inserted. The material must be in continuous strips, so as to be easily and completely withdrawn; and the best substance is a carbolic gauze bandage, for this is stiff at first, and fills the uterus, but shrinks down under the compression of the contracting uterus, and so does not interfere with retraction. Three lengths of four or five yards each, three to four inches in width, will almost always be found ample. On an emergency a sheet may be used, torn into correspondingly sized strips, and sterilised by boiling.

Mode of Performance.—The bladder and rectum are to be emptied if possible, though this will hardly be so in the emergency. The woman may be on her side or on her back, the latter being the more convenient position. An anæsthetic will hardly be required, and is in practically all cases unsafe, considering the probably collapsed state of the woman. One hand, preferably the left, having been made aseptic, is introduced into the uterine cavity so as to reach the fundus. The nurse will hold the roll of gauze or other material, and will supply it as required, sprinkling it with iodoform as it is being passed in. A bunch the size of a small fist or less, is seized in the forceps and carried up along the already introduced hand quite to the fundus, where it is caught between the index and middle fingers and held. The forceps is withdrawn, and a foot or so of the bandage is seized and carried up to the fingers as before, care being taken that each portion of the plug is carried up as high as possible. When one bandage has been used the nurse will knot a second one on to the end of it, and then a third. By the time the second one has been passed in, the uterus will have contracted down on its contents, and there will, as a rule, be room for about half the third. The vagina should then be lightly packed with the remainder. In about twelve hours the plug is to be removed by drawing on it from the lower end. It will be found to be saturated with serum, but there will be little, if any, clot on its surface. An antiseptic douche is then to be given.

[1] Duhrssen.

Advantages.—This method of treatment has undoubtedly saved a very large number of lives. It would seem unphysiological, but it is found in practice not to interfere with retraction. If it is not properly done, and the first part of the plug does not reach the fundus, it may not be successful, for the uterus may bleed into the cavity above the plug; and this, no doubt, accounts for cases where the operation has failed. It has been argued against plugging that air may be admitted into the uterine sinuses while the plug is being inserted; but this accident is not in the least more likely to happen than when an intra-uterine douche is being given.

Dilatation of Cervix

Purpose of the Operation.—The cervix may have to be artificially stretched so as to *allow of the passage of the fœtus*, or *instruments*, or of the *finger or hand* of the operator; or *to allow* the *bag of membranes to protrude*. Its action is combined with that of plugging when it is used *to check hæmorrhage* from a uterus which is not too large (see p. 353, vaginal plugging).

Instruments.—The instrument used depends on the purpose in view. Where the cervix is as yet small, and will not admit a finger, as in rigid os (p. 456), placenta prævia, cases of molar pregnancy, inevitable or incomplete abortion, a tent of one of the kinds in common use is the best means. These actively expand in a manner peculiar to each kind. The cervix may be plugged with a strip of linen, and this will act as a dilator. Dilatation can be performed with Hegar's, or other graduated dilators. The cervix can only be stretched to a moderate degree, say enough at the most to admit two fingers by these means; and, to carry it further, bags of indiarubber or waterproof silk, which can be distended with air or water, must be used. The fingers themselves may be employed as soon as one can be passed, by adding one finger after another, first the tip, then the whole length being gradually inserted, until the hand can be introduced in the form of a cone. This method is very fatiguing to the fingers, and if great patience is not exercised, lacerations of the cervix may be caused.

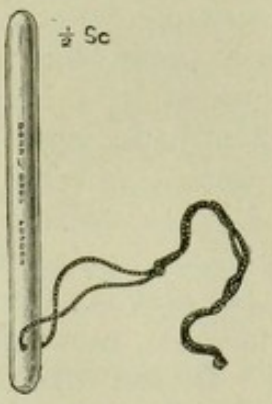

Fig. 287.—Laminaria tent.

Tents.—The three kinds in common use are those made of sponge; of laminaria, or sea-tangle; and tupelo-wood. Opinions differ as to the relative value of each of these, but in obstetric practice sponge-tents are usually satisfactory, since although they do not dilate with any force to speak of, the dilating power they possess is all that is needed in this class of case (and probably to a great degree this is so in any case), seeing that their main action is to stimulate the uterine body to contract by reflex action, and so to cause softening and relaxation of the cervix. They do not forcibly expand and stretch the canal against all opposition, for this would mean laceration. Laceration never occurs with tents of any kind, and even when laminaria tents, which expand with some force, are used, the internal os, if it is rigid, leaves a mark of constriction on the swollen tent.

The objection made to sponge-tents was that they could not be made aseptic. This process, which is essential, can be carried out as well in the case of sponge as in that of other kinds. The tents before use are placed for an hour or more in a 1–1000 solution of corrosive sublimate in absolute alcohol, or in an ethereal solution of iodoform. Of course, a watery solution of any antiseptic would swell them and make them useless.

Method of Use.—The bladder and rectum are to be emptied. The vagina must be washed out with an antiseptic solution. The cervix is then caught with a volsella, with or without the aid of a speculum, and drawn down as low as possible, or at all events, steadied. If the cervix is brought down to the vulva, or near enough to be within easy reach of the fingers, the tent, lubricated with a solution of sublimate in glycerine (1–1000), can be placed in position. The largest-sized tent which it is judged will pass should be used, and if possible one or more others should be introduced by its side. In some cases, especially in those of abortion, the short tents usually employed may slip right through the cervix into the body of the uterus, and lie there useless; so that it is better, where there is not enough resistance (such as a placenta prævia) above the internal os to prevent this accident, to use a longer tent, which can be obtained from the instrument makers.

Another way of placing a tent is to steady the cervix with a volsella, and to pass the tent in on a Barnes' tent-introducer; or the uterine forceps may be used through a Sims' speculum.

The first-described is by far the best way, for if more than one can be got in, the first tent is prevented from slipping out, which it has a great tendency to do, by the finger of the hand holding the volsella. The narrow end of the tent is passed in first, and the thread attached to the thick end should lie just outside the external os. The vagina is then to be lightly plugged from below, and the tent left in about eight hours, the woman being kept in bed. At the end of the time the tents are to be taken out by pulling on the thread, and the vagina is douched again. The safety of the operation depends on its being carried out aseptically.

In cases where rapid dilatation is necessary, as in severe examples of accidental hæmorrhage, or where there is a putrefying ovum to be extracted, Hegar's dilators are useful. Dilators made of separating blades are dangerous, for one blade may penetrate the tissues if they are at all soft. In obstetric cases rapid dilatation by Hegar's dilators may be at once carried to a degree easily admitting a dilating bag of some kind without any danger.

Fig. 288.—One of a set of Hegar's dilators.

Hegar's dilators are made of vulcanite as a rule, they vary from four to six inches in length in different patterns, and are provided with a handle. Their diameters ascend by the increase of 1 millimetre, the smallest dilator being 2 mm. in diameter.

The woman is to be placed in the lithotomy position, and the cervix, seized with a volsella by its anterior lip, is pulled down to the vulva, and then

its posterior lip is caught with another volsella. It is safer to use two than one only, for another puncture is not so dangerous as the laceration which will be caused if the one happens to tear through. The largest dilator which will pass without force is now to be introduced, and then the

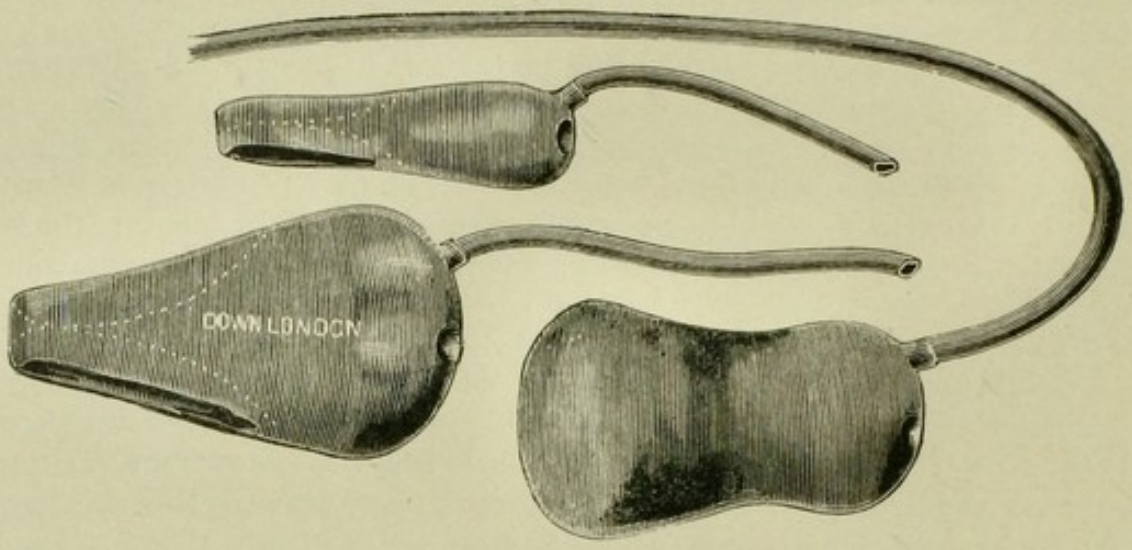

Fig. 289.—Hydrostatic dilators modified from Barnes's original pattern.

others in succession, the moment for proceeding to a fresh dilator being indicated by the loosening of the grip with which the cervix first embraced the one then *in situ*. If any force is required to introduce a fresh one, the last bougie should be re-inserted for a short time. The cervix will allow one finger to pass at about No. 20 or 21 ; or the dilatation can be taken further if it is wished to introduce a hydrostatic bag.

Dilating Bags.—These are distended with water or with air, after being introduced empty. Water is the better element to employ, as it is incom-

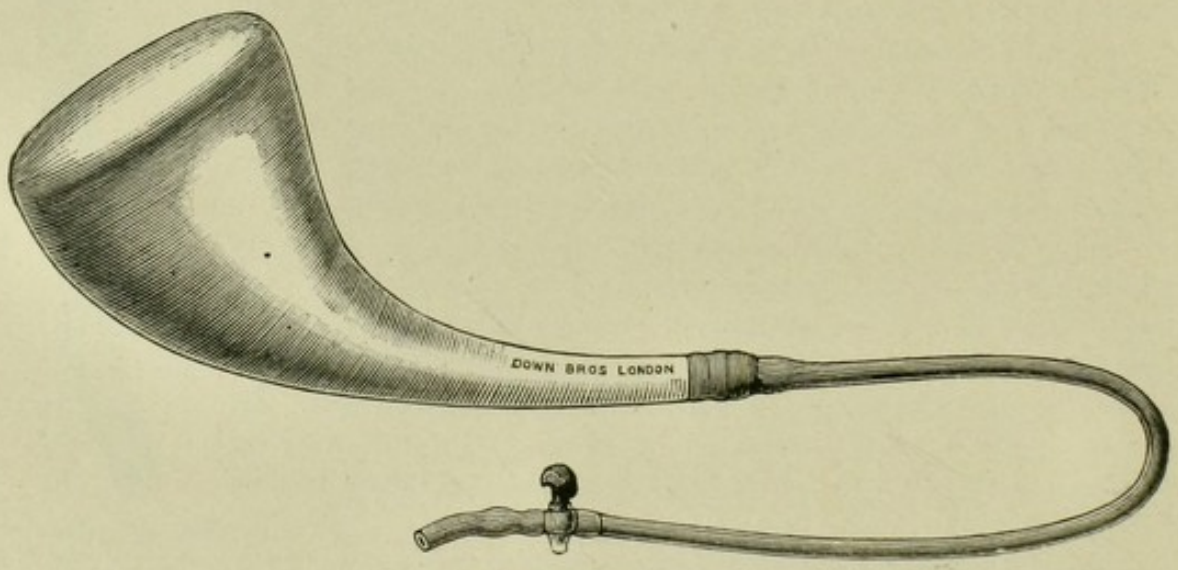

Fig. 290.—Champetier de Ribes' bag.

pressible ; and it can be easily made aseptic, so that in case of the bag bursting no danger is incurred from the introduction of micro-organisms.

(1) *Barnes's Hydrostatic Dilators.*—These are india-rubber bags, fiddle-shaped, so as to be caught at the waist by the cervix, the bulge above and below

keeping them in place (fig. 289). They are introduced by passing a rod into a tube running up the middle of the bag. The corners fold in when the bag is empty, so as to facilitate the introduction. The smallest size will have to be introduced, expanded, and allowed to remain until it is expelled into the vagina, or is found to be easily withdrawn from the cervix. This will take half an hour or so as a rule, and a bag should not be left in more than an hour without an examination being made of the condition of the cervix. Before introducing it, it is well to find out how many syringefuls each bag will hold when tightly stretched, and not more than this should be pumped into it, for fear of bursting it. The next-sized bag should be introduced in the same way, and so on, until a sufficient degree of dilatation has been reached. These dilators imitate the action of the membranes fairly closely; they have, however, in common with the kind to be next described, the disadvantage of displacing the head somewhat. The presentation should therefore be examined into after the withdrawal of each bag, and rectified if necessary by manipulation. Another objection is that the frequent manipulations necessitated by the introduction of successive bags make the chance of entrance of septic matter greater than if a bag such as Champetier de Ribes' is used, where one introduction only is needed.

(2) *Champetier de Ribes' bag*, a modification of Tarnier's, is a conical bag made of water-proofed silk, an unstretchable material. Its base is 3½ inches in diameter, and it tapers down to the diameter of the tube by which it is filled in a length of about 6 inches, its axis being slightly curved so as to accommodate itself to the axis of the genital canal. It will hold about 17 ounces of fluid (fig. 290).

It is introduced by a pair of long-bladed forceps (fig. 291). These grip it in a rolled-up form, and will pass it through a cervix sufficiently dilated to admit a thumb. It should be passed about half-way through the internal os, and the forceps disjointed and removed one blade at a time. The bag is then expanded by a solution (antiseptic in case of its bursting), about 17 ounces being used.

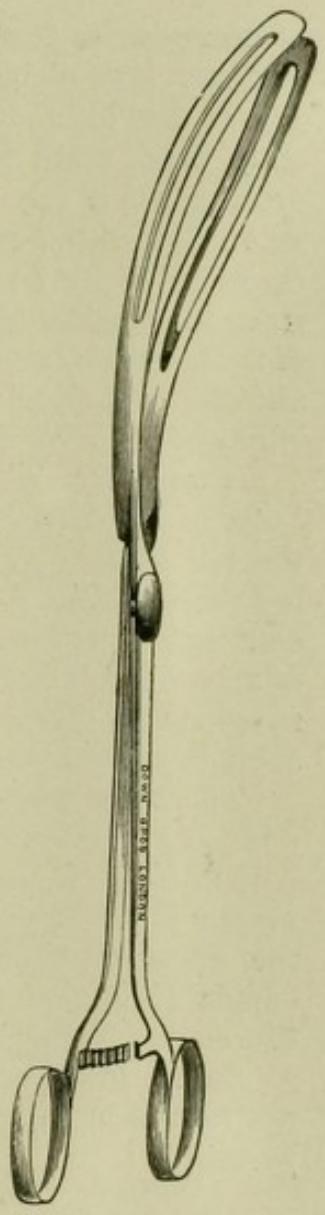

Fig. 291.—Forceps for de Ribes' bag.

As the uterus contracts it forces a wider and wider part of the bag through the os. When the bag has been expelled into the vagina the cervix will have been stretched to a diameter of 3½ inches, and is large enough to allow the head to pass. It has the advantage over Barnes's form of dilator, besides the one already mentioned, that although it displaces the head to an equal or perhaps greater degree, it has produced, by the time it has done its work, sufficient dilation to make version an easy matter so far as the cervix is concerned. Further, if there is hæmorrhage going on from the placental site in a previous placenta, and the uterus is inert (as it most often is), the bleeding area can

be compressed by pulling on the tube, and thus bringing a wider part of the bag into action.

Dilatation of the vagina and vulva is dealt with on p. 458.

Infusion of Saline Solution

Definition.—In this operation an inert fluid is added to the blood-mass by opening a vein and allowing the fluid to run in under slight pressure.

Purpose of the Operation.—This is to raise the blood-pressure in cases of acute loss of blood. When the vascular system is drained to such a degree that little more will run away, and the person is pulseless and apparently dead, there is still enough blood in the body to carry on the vital processes if it can be kept circulating. The blood-pressure has, however, fallen so low that not enough fluid reaches the heart to expand it, and thus no propulsion is possible. Also the heart and its nervous ganglia are starved, since the coronary arteries are unfilled, and it ceases beating. The addition of fluid, before cessation of the heart has happened, raises the blood-pressure and allows of circulation of the remaining blood ; and the tissues are supplied with enough oxygen by the remaining corpuscles to keep them alive.

It was believed up to recently that to obtain any benefit in really severe cases of hæmorrhage actual blood must be transfused, either directly from the vein of the donor into that of the patient ; or, indirectly, after defibrinating it so as to avoid the danger of embolism by particles of fibrin formed by clotting. It is probable, from observations made of late, that the transfusion of actual blood did more harm than good, and the only good done was due simply to the increase of the blood-mass. This is effected equally well by using some inert fluid : that is, one which will not damage the blood or its corpuscles.

There are other ways of utilising the amount of blood remaining in the body after a severe bleeding, such as auto-transfusion and inversion of the patient (see treatment of post-partum hæmorrhage, p. 485) ; and the blood-mass may be increased by rectal injections of water or saline solution, or by the injection of such fluid into the muscles of the back through a sharp canula (Münchmeyer's method) ; but these do not act so quickly or so thoroughly as infusion into a vein, and are only good in slight cases.

Saline infusion is very useful, too, in cases of shock unaccompanied or not caused by bleeding, and no doubt acts by raising the diminished blood-pressure.

Instruments Employed.—All that is absolutely required beyond what is to be found in most midwifery bags, or in most households, is *a canula* to insert into the vein. This canula (fig. 293) is of the same shape and size as those used for the transfusion of blood.[1] It is connected with a length of tubing, through which the fluid is poured by a funnel affixed to it (fig. 292).

Any clean funnel will do that will fit the tube, and a piece of tubing is easily obtained by cutting off some of the tubing attached to the douche tin

[1] A short bent tube, of metal or of glass, bevelled off or not at the end which enters the vein, and of convenient diameter to go into a vein the size of the median basilic.

or to a Higginson's syringe, if there is none carried in the bag. A canula has in an emergency been made out of a piece of quill pen, or even out of a toothpick, either being of course made as aseptic as possible.

The best *fluid* to use is one which is as near the normal specific gravity of the blood-serum as possible, and fortunately this can be readily made by dissolving a teaspoonful of common salt in a pint of water. The water should be boiled, if possible ; but both the boiling and the salt may be dispensed with if there is great urgency.

The temperature should be about 102° F., but this is not essential, as long as it is not below 90° F.

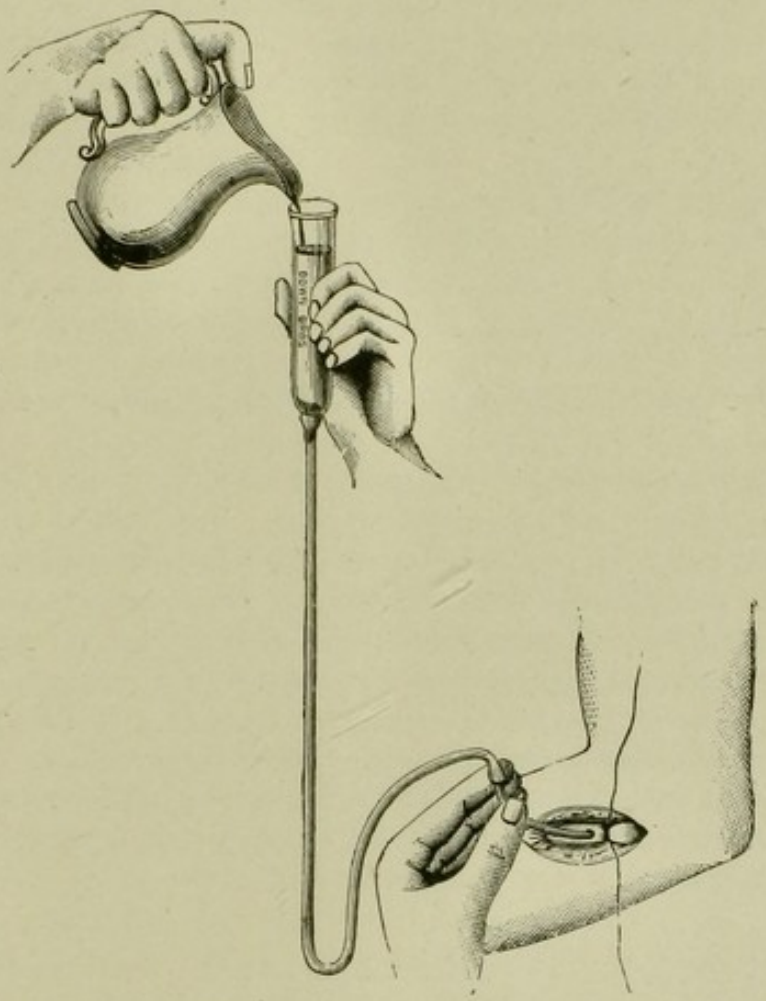

Fig. 292.—Infusion of saline fluid. (After Horrocks.)

A canula takes up no room, and may be taken to every case ; and a foot or two of rubber tubing is a most useful article to be included in every obstetric bag.

A scalpel to expose and open the vein, and some ligatures and a pad of antiseptic material to tie the vein and dress the wound with, are needed.

Method of Performance.—An incision about two inches long is to be made over the median basilic vein ; this is to be isolated, and a ligature passed under it double. The loop of this is cut, and the two ligatures separated upwards and downwards. The lower one is tied in the inferior angle of the wound, and its ends cut off (fig. 293). The vein is then opened by an

incision at an angle with its long axis and across its length, large enough to allow the canula to pass. When the canula has been passed for about an inch into the vein on the upper side of the incision, the upper ligature is to be tied with one knot only over it as it lies in the vein. The canula and tube must have been previously filled with the warm fluid, and must contain no air. The fluid is now run in from a bottle or funnel about 2½ to 3 feet above the level of the patient. Spencer advises that it be run in very slowly, at the rate of one ounce per minute, because there is a risk of over-distension of the venous circulation, shown by venous pulsation, if this rate is much exceeded. Other operators, however, have run the solution in much faster than this; a pint every four minutes, for instance, without any ill results; and in a case of the author's, five pints were infused in fourteen minutes without any harm being done.

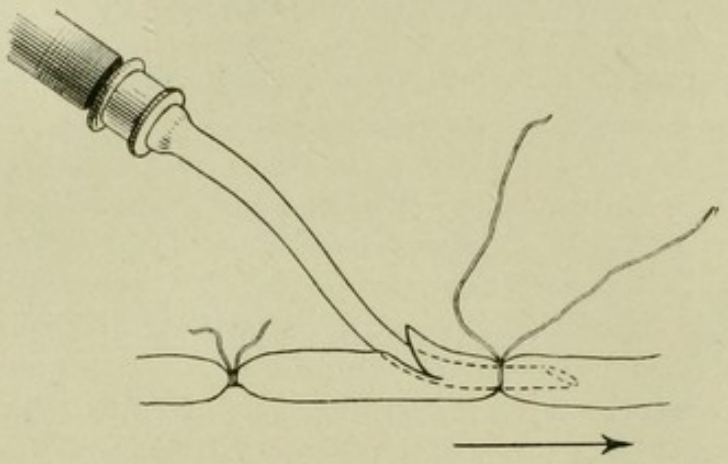

Fig. 293.—Canula and ligatures in position.

Four or five pints should be injected as a rule; or it may be judged how much blood the woman has lost, and then rather more than that quantity used.

All bleeding must be arrested before infusion is performed; for, unless this is done, the solution will merely wash out the vascular system, and leave the woman in worse plight than before. The uterus must therefore be satisfactorily contracted and retracted in cases of post-partum hæmorrhage; and the bleeding points in the broad ligament tied in the case of ruptured tubal gestation, before this operation is done. When enough has been injected, the canula is to be withdrawn, and the ligature tied tight on the vein. The wound is then cleaned and sewn up, and a pad, bandage, and splint applied.

CHAPTER XLVIII

OBSTETRIC OPERATIONS (*continued*)

Induction of Premature Labour

Definition.—This term is usually applied to cases where induction is employed after the seventh month, when it is possible to rear the child that is born. In earlier pregnancy than this the term Induction of Abortion is most commonly employed. The distinction is merely a matter of convenience and both operations are considered here.

Purpose of, and Indications for the Operation.—The conditions requiring evacuation of the uterus may be divided into two groups :

1. Cases where the *genital canal is contracted* to such a degree that the delivery of a living child at term through it is judged to be impossible.

2. Cases where it is *unsafe for the pregnancy to continue* owing to its being complicated by some serious disease, which the cessation of the pregnancy will relieve if not cure ; or where there is some serious and immediate threatening of the woman's life which will certainly or probably be removed by evacuation of the uterus.

In group 1 the most important reason for the operation is contraction of the bony pelvis. It is also necessary where the space is diminished by tumours of the soft parts which cannot be removed, such as fibroids of the lower part of the uterus, cancerous masses in the pelvis, tumours of the pelvic bones encroaching on the pelvic diameters, and undilatable cicatrices of the cervix and vagina.

In group 2 are all cases of albuminuria dependent on renal disease which do not shortly yield to treatment, very severe cases of the vomiting of pregnancy, some cases of chorea, especially if mania is threatening, some cases of hydramnios, especially if this is complicated with lung trouble, irreducible retroversion of the gravid uterus, signs of acute atrophy of the liver, placenta prævia, some cases of accidental hæmorrhage, and uræmic convulsions.

In the first group the operation is undertaken entirely on the child's account ; in the second, rather on the mother's, but partly on the child's also.

Methods.—The ones now in common use are (*a*) by the introduction of a bougie into the uterus ; (*b*) by puncture of the membranes, both of which acts stimulate the uterus directly to contract ; and (*c*) occasionally by the use of tents, which stimulate the uterus indirectly by dilating the cervix.

A large number of other methods have been used at one time or another, and they may be merely enumerated. The use of drugs (ergot, digitalis, quinine, savin, rue, &c.) is a quite uncertain way, and one which in a large majority of cases has no effect at all. Electricity has been used to induce labour in the form of the Faradic current, but it is very tedious and painful to the woman. Injection of water, air, or carbonic acid gas into the space between the membranes and the uterine wall ; this is most dangerous, and death has been caused by air-embolism, and by shock in cases where such means have been employed. Glycerine in small quantities has been used also, and this is apparently safe and effectual.

Another method is that of the vaginal douche (Kiwisch). This consists in the direction of a stream of water into the vagina during sittings of a quarter of an hour or so at a time. It is tedious and uncertain, and is liable to cause extreme tenderness of the vagina from the long-continued run of water over its surface, and removal of the superficial epithelium. Dilatation of the vagina by a bag of some kind (the first person to use this method was Huter, who introduced a calf's bladder, smeared with oil of hyoscyamus, in very early times). Braun's colpeurynter is a variety of this ; it is uncertain, and has caused serious trouble. Other ways are by rectal injections, and by irritation of the nipples, both of which are quite unreliable.

Each of the three methods now in general use has a class of case for which

it is most suitable. In group 1 the bougie is the best means ; in group 2 it is also best in all the cases enumerated down to chorea ; in the others, except perhaps when acute atrophy of the liver requires it, puncture of the membranes is most suitable. In cases where abortion is necessary, tents may be employed, as they not only start labour, but they also prevent excessive loss of blood, and prepare the cervix for the passage of the ovum without great difficulty. We may take a typical example of each class of case, and describe the method of induction.

By Bougie.—In a case of contracted pelvis (see p. 439) the time of induction is determined on. The woman is prepared for operation by having the bowels well cleared out, and the vagina made as aseptic as possible by treatment lasting about forty-eight hours. The instrument used is a bougie with a stilet. A catheter is objectionable, for when its lower end is in the vagina, where it rests, it forms a channel for admitting air into the upper part of the uterus.

The bladder is emptied and the woman is placed on her left side. If the placenta can by any chance be felt externally, its site should be noted. The index finger of the left hand is then to be passed up to or into the cervix, and the bougie with the stilet in its place passed through the internal os. It should then be pushed gently along the posterior uterine wall for about one inch only, for fear of puncturing the membranes ; and then the stilet is to be held by an assistant and the bougie pushed off it into the uterus for seven or eight inches or more, or as far as it will go. The greatest gentleness is to be used, so as to avoid puncturing the membranes or detaching the placenta. It is of no importance towards which surface of the uterus it is introduced, but it will usually run most easily along the posterior wall, as this is most in a line with the vaginal curve. If the placenta has been found on the anterior wall by abdominal examination, it can be avoided. If it is found that the bougie cannot be introduced far enough in one direction or the other, another place must be tried. When all but an inch or so has been passed into the uterus, or when at least seven or eight inches are in, the remainder is to be coiled in the vagina, and a light plug inserted to keep the bougie in its place. The instrument is to be left in until the pains begin, if this happens in less than twelve hours. If it does, nature may be allowed to finish the process ; but if not, a second bougie should be inserted, and left for six hours with the first. There will in all probability be some pains at the end of this time. If, however, there are not, there is sure to be some softening and patency of the cervix, and through the cervix a de Ribes' bag or a Barnes's bag may be passed and expanded. Labour is almost certain to be started in earnest by this ; if not, the process of dilatation may be completed by the bag. After two bougies have been introduced in the way described, it is useless to insert more ; and it is dangerous to wait longer, since the constant examinations and the introduction of air which must take place, add great risks to the operation. The bougies may be left to be expelled with the child or may be removed earlier.

By Puncturing the Membranes.—In a case of eclampsia, the passages are made aseptic, and the woman is anæsthetised so as to avoid the induction of fits by the necessary manipulations. She is placed on her side, and a sound is passed through the cervix and onwards until the resistance of the mem-

branes is felt. Then with a slight jerk it is pushed through them. Directly the resistance has disappeared, showing that the sound has gone through the membranes, its further entrance must be arrested, lest some damage be done to the child above. After most of the liquor amnii has drained off, relieving the uterine tension, the cervix must be artificially dilated with one form of bag or other ; for the first stage will otherwise be long, and will possibly cause the death of the very likely premature child.

In case it is necessary to induce abortion during the earlier months, for albuminuria or for pernicious vomiting, for instance, tents are on the whole the best instruments, being of course made aseptic. The alternative method is to pass a uterine sound, and rotate it in the cavity of the uterus. The tent has the advantage that it dilates the cervix, and this is important, since dilatation is in these cases often very slow and incomplete, leading to much loss of blood ; and, if the child is at about the fourth month, and it is necessary to extract it, the limbs are very readily torn off if attempts are made to drag the body through an undilated cervix. Or if the ovum is of earlier date, a dilated cervix makes its complete expulsion without rupture more likely. If the sound is used in early cases the ovum will very likely be ruptured, and some of it may be retained ; and in later cases, where the amnionic sac could be of some use in dilating the cervix, and the separation of the membranes would go on better if they remained entire until full dilatation, these advantages are lost on rupture.

The advantages and disadvantages of Induction of premature labour, as compared with Cæsarian section, are discussed in the chapters dealing with Contracted Pelvis, Cancer of the Cervix, &c.

CHAPTER XLIX

OBSTETRIC OPERATIONS (*continued*)

VERSION

Definition.—Version or turning consists in artificially changing the lie of a fœtus. Transverse lies are in any turning converted into longitudinal ones ; and in certain cases cephalic lies are turned into podalic ones.

It will be well for the student, before reading the further description of this operation, to read the chapter on Transverse Lies, and the natural processes of Spontaneous Rectification and Spontaneous Version (p. 466).

Object of the Operation.—This may be (*a*) to place the child in the most favourable lie for delivery alive ; (*b*) to save the mother's life by arresting hæmorrhage or hastening delivery, and (*c*) to render delivery possible in the case of certain monsters.

In group (*a*) are included versions performed in *transverse lies* ; in certain forms of *contracted pelvis* (p. 442) ; in a few cases of *prolapse*, and the majority of cases of *expression, of the cord* (p. 514).

In group (*b*) are cases where the operation is done for *placenta prævia* (p. 341); in a few cases of *accidental hæmorrhage*, in *eclampsia*, and other instances in which rapid delivery is essential.

The *delivery of monsters* by turning is discussed later.

Version is in some of the cases where it is required an imitation of the means adopted by nature for relieving the situation. This is seen in the case of transverse lies; for these mostly occur in connection with contracted brim, which first of all causes the child to lie with its long axis across the abdomen, and then Spontaneous Version may render delivery possible. In placenta prævia also, the transverse lie which has a tendency to occur is a step in the direction of version. It is true, however, that nature does not, as a rule, give time for the version to be complete in these cases, particularly in the last-mentioned one; but the fact that there is a natural tendency for the movement to take place brings the operation of artificial turning into the category of procedures by which nature is assisted, rather than into one in which the natural tendencies have to be disregarded.

Methods of Performance.—There are three ways of turning. (1) by external manipulations, (2) by combined (bimanual) external and internal manipulations, and (3) by internal manipulations.

1. *By External Manipulations.*—For this operation, which is rather a difficult one as a rule, the membranes must be entire, or only just ruptured, and the woman must have a thoroughly relaxed abdomen and uterus. She must lie on her back at first, so that all the available surface may be readily got at, and the bladder and, if possible, the rectum must be emptied. The exact lie and attitude of the child must be ascertained. Relaxation of the abdomen may be obtained if necessary by an anæsthetic.

If it is wished to turn by the head (cephalic version) in a case of transverse lie, the only condition under which cephalic version is required, one hand must be placed on that side of the child's head which is furthest from the brim, and the other on the opposite side of the breech. The head is then to be pressed by a series of pushes rather than by steady force towards the middle line of the woman's body, and the same manipulations used at the breech end. After the head has been got to lie over the brim, an attempt must be made to press it through this, as described on p. 439.

This will show if it will pass through the brim. It is useful, when the hands have been arranged on the fœtus, to place the woman on the side towards which the head lies, so that the action of gravity may help to bring the breech over. If it is judged that the head can pass the brim, the membranes may be ruptured when the os is three parts dilated, the head being retained in its relation to the brim as long as is necessary. A binder may be sufficient to keep it there; or it may have to be held there by the hands. If the brim will not admit the head, podalic version of some kind will have to be undertaken.

Podalic version is never done in this way, for it is always necessary in turning by the feet to seize a leg or foot, and to bring this down through the os. It is therefore much easier to turn by the combined method, to be immediately described.

2. *Combined External and Internal Method.*—This is best described in the words of Braxton Hicks, to whom is due the origination and description of this operation. He takes the case of a child, presenting in the first position of the vertex, which it is necessary to turn for the sake of delivery in a contracted pelvis, or in the treatment of placenta prævia. The os uteri is dilated to admit one or two fingers, and the membranes are perfect.

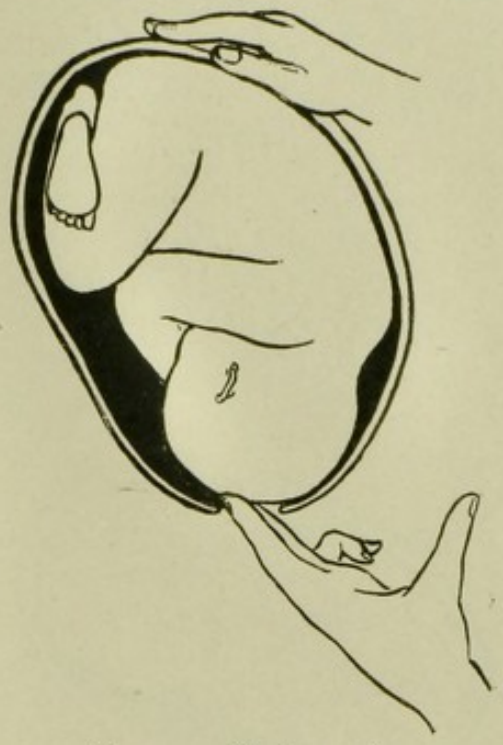

Fig. 294.—Bipolar version.

'The patient may be placed in the ordinary obstetric position. Having lubricated my left hand, I introduce it as far into the vagina as is necessary in order to reach a finger's length within the cervix; sometimes it requires the whole hand, sometimes three or four fingers will be sufficient in the vagina. Having clearly made out the head and its direction, whether to one side or the other of the os uteri, I place my right hand on the abdomen of the patient towards the fundus; I then endeavour to make out the breech, which is seldom a difficult matter. The external hand then presses gently but firmly the breech to the right side; as it recedes, the hand follows it either by gentle palpation, or by a kind of gliding movement over the integuments, while at the same time the other hand pushes up the head in the opposite direction, so as to raise it above the brim (fig. 294).

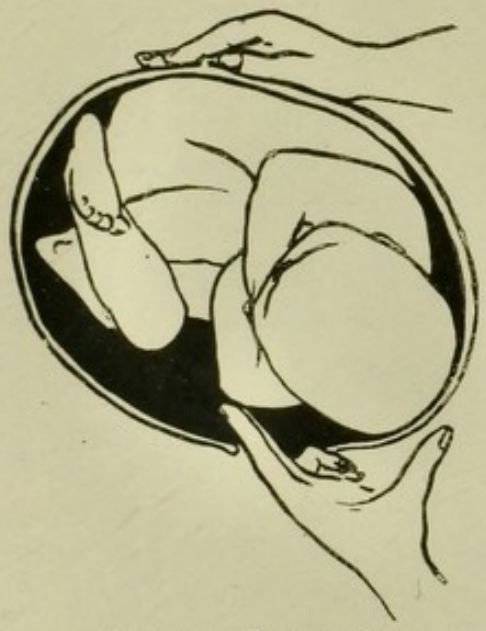

Fig. 294 A.—Bipolar version.

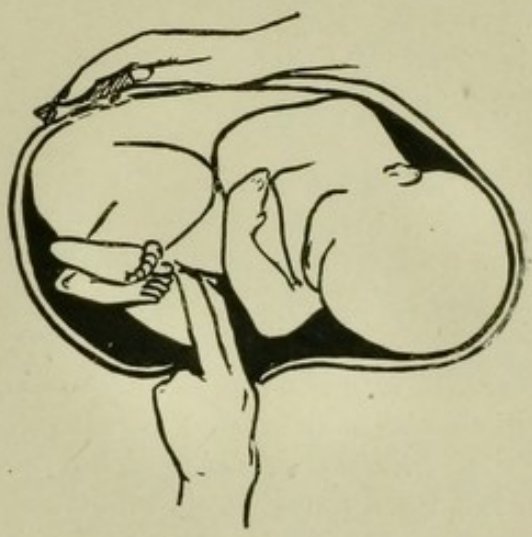

Fig. 294 B.—Bipolar version.

'It may here be mentioned that when the head has descended a considerable distance into the pelvic cavity, or more than half-way through the os uteri, it is scarcely possible to lift it above brim, especially if the uterus be active.

'When the breech has arrived at about the transverse diameter of uterus, the head will have cleared the brim, and the shoulder will be opposite the os (fig. 294 A). That is pushed on in like manner as the head, and after a little further depression of the breech from the outside, the knee touches the finger, and can be hooked down by it (fig. 294 B).

'It very frequently happens when the membranes are perfect that as soon as the shoulder is felt, the breech and foot come to the os in a moment, in consequence of the tendency of the uterus to bring the long axis of the child coincident with that of its own.

'Should it therefore be difficult to hook down the knee, depress the breech still more, and it will almost always be the case that the foot will be at hand.

'It will sometimes render turning more easy if, as soon as the head is above the brim, we pass the outside hand beneath it, and push it up from the outside alternately with the depression of the breech. All this can generally be performed in much less time than I have taken to describe it, although in some it requires gentle, firm, and steady perseverance, with such a supply of patience as is always required in obstetric operations.' [1]

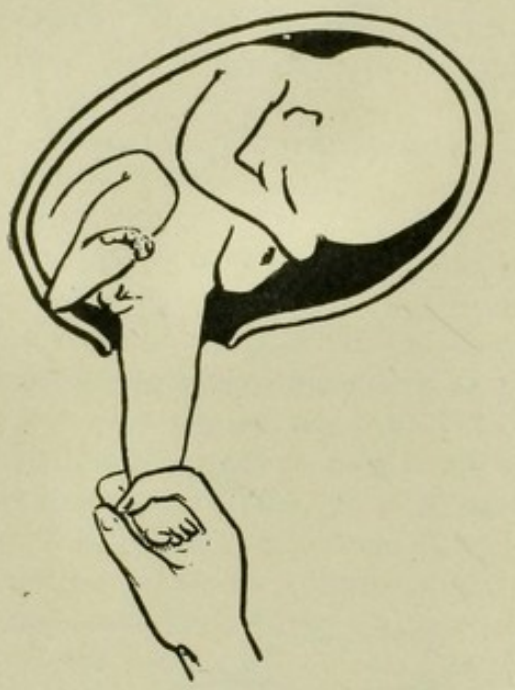

Fig. 295.—Bipolar version.

It may be said in addition that two fingers should always be introduced through the os, for the foot cannot be readily brought down into the vagina by one finger alone (fig. 295). The operation may be done with the woman on her back, and in this case it will be found more convenient to introduce the fingers of the right hand into the os.

The same method may be used for cephalic version; the head is, as a rule, easily brought between the internal and the external fingers, and, as Hicks says, 'will play like a ball between the two hands,' and may be placed in any position over the brim.

He points out the advantages of this over the internal method—namely, that it may be employed much earlier, and that malpositions may be rectified almost as soon as recognised. Early version is of very great importance in cases of complete placenta prævia. Also the entry of the whole hand and forearm into the uterus is avoided, a matter of great weight, and there is no likelihood of admitting air into the uterus.

3. *Internal Method.*—This mode of turning is now limited to cases where it has been found impossible, either from want of practice on the part of the operator, or from immobility of the fœtus, to employ the combined method.

The os must be sufficiently dilated to admit the hand with gentle pressure if necessary. This is to be passed in the shape of a cone through the os and through the hole in the membranes, which must for this purpose be ruptured if rupture has not already occurred. The position of the child

[1] Hicks, *On Combined Version*, p. 12; London, 1864.

should have been made out beforehand, and the hand is then passed up its abdominal aspect, the more convenient hand being chosen. If the child faces to the woman's right, as is the commonest, turning will be most easily done while she is on her back, and with the left hand internal; while if the limbs face to the woman's left, the right hand is more convenient, whether she is lying on her back or on her side. The hand is to be passed up during the intervals of the pains till it reaches a knee. The one that comes first is to be seized, and this has been shown by Galabin to be the better as well as the easier. The fingers are then run along the leg to the foot, and this is to be brought down through the os. While the foot is being pulled down the head will easily be pushed up by the other hand if this is necessary; but it usually rises spontaneously. Instances where this does not happen arise where the contraction-ring prevents the head from escaping from below it, or where the shoulder is below the internal os. Turning is, as a rule, not the best operation where this state of affairs exists (see p. 473).

It has been recommended to put a tape round one arm if this is within reach, as it would probably be in transverse lies, before version is begun, and even to bring down an arm for this purpose through the cervix. This is done for the sake of rendering extraction easier, and to prevent the arm from rising above the head. It is very likely, however, that some amount of liquor amnii, a very precious fluid at this juncture, will be lost while it is being done; and unless the arm is very near, or through the os, it is best not to complicate matters in this way.

If the child does not turn pretty easily when the legs are pulled upon, and if the uterus is still safe from tetanus or over-retraction, it will help matters to act on both poles of the fœtus at once. This may be done by tying a tape round the ankle that has been seized, and pulling on this with one hand while pushing up the head with the other. A small blunt hook with a flexible handle, as recommended by Hicks, may be used to pull down the knee, while the free hand pushes up the head.

Both legs are not to be brought down, for then the child's pelvis passes the os without dilating it sufficiently, and the head has to do this for itself, thus considerably imperilling the child (p. 200).

When by one or other of these methods the fœtus has been brought into a longitudinal lie, it depends on the case whether it is to be left to be expelled or is to be extracted. After cephalic version, if speedy delivery is required, and the brim is large enough, the forceps may be used. If there is no need for quick delivery—as, for instance, in a case of transverse lie in a normal pelvis—the uterus may be left to finish the labour.

After podalic version, however, it is usually necessary to extract, since the reason for version has been either a contracted brim, or else some condition where speedy delivery is required for the mother or the child.

Extraction.—The leg which has been brought down should be wrapped in a thin cloth so as to prevent its slipping through the fingers. The body is easily drawn into the vagina, and in doing this the operator must allow for the natural rotations, and should help, as he should throughout the whole of extraction, by external pressure. The pull must at first be as far as possible in the axis of the inlet.

When the breech is on the perinæum the pull must be more in the

direction of the outlet, so as to clear the posterior buttock and hip from the vulva. The clearance may be helped by hooking the finger over the flexure of the thigh. This stage must not be hurried more than is necessary, so that time may be allowed for the vagina and vulva to dilate in readiness for the head. Traction in the axis of the brim must now be resumed, so that the shoulders may enter properly. The cord will need some attention at this stage.[1]

When the shoulder-blades have come down to the vulva the arms should be looked after; they are to be brought down as advised on p. 200. The head may be helped down by jaw-traction at the brim, which will also have the advantage of preventing extension; and if the vagina is so lax, or the child so small that the whole hand can be introduced by the side of the latter, a finger may be placed on each shoulder, and used for pulling. Or the forceps may be used. When the head has reached the cavity, the same methods are to be employed as in an ordinary breech case where the head is delayed.

Contra-Indications to Version.—This operation must not be attempted when the head in a cephalic lie has passed the cervix by its largest circumference, and *à fortiori* when the head is in the vagina; and it will as a rule be difficult and inadvisable when the head is well engaged in the brim. Advanced retraction of the uterus is an absolute contra-indication. A flat pelvis with a conjugate of less than three inches is not suitable for this treatment, or a generally contracted pelvis of a larger conjugate, unless it is preferred to do craniotomy on the after-coming head (see p. 392). It is not safe in cases of considerable exhaustion of the mother; and it is useless in the case of a dead child, except possibly in the event of a placenta prævia, where a half-breech forms a handy plug.

Advantages and Disadvantages.—The class of case where turning most markedly comes into competition with other operations is in contracted pelvis, and under that heading it will be found discussed. Perhaps placenta prævia might be added as an occasion where its value might be compared with that of de Ribes' bag (see p. 346).

[1] Barnes agrees with May and Wigand in recommending ligature of the cord at this time if the pulsations are slowing, considering that the pressure will compress the vein more than the arteries in the cord, and that the child will thus be to some degree drained of blood. If it is done, one would think that the future steps of extraction ought to be as rapid as is safe for the mother; but this does not seem in reality to be so very urgent.

CHAPTER L

OBSTETRIC OPERATIONS (*continued*)

THE FORCEPS

Description.—The forceps[1] is an instrument by which the head is grasped, so that it may be pulled through the whole or part of the length of the parturient canal. It is made so as to cause no damage to the head if used in the proper way. The child in a successful operation with the instrument is delivered alive and unhurt.

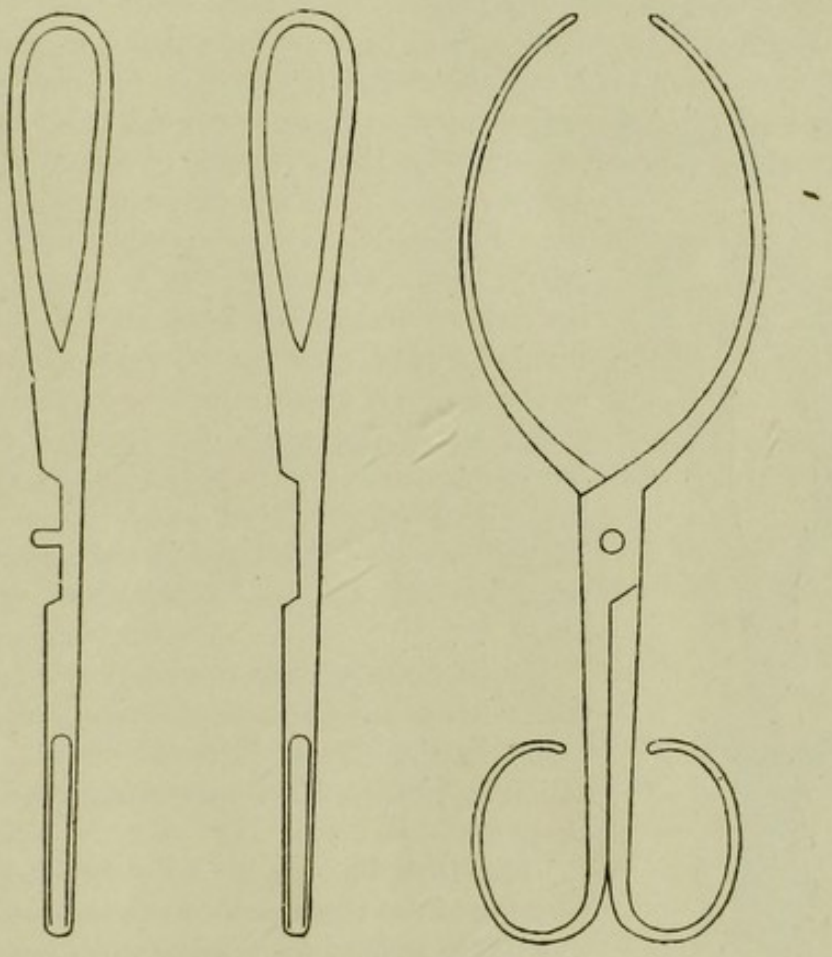

Fig. 296.—Chamberlen's forceps.

Its construction has gone through many stages of involution since the instrument was first invented by Peter Chamberlen in the early part of the

[1] *Forceps*, Lat. pincers; derived, according to Skeat, *Etymological Dictionary*, from *formus*, hot, and the root cip- (*capere*, to take). This derivation makes impossible such a monstrous word as retroceps, which is coined on false analogy with forceps, the for- in the latter word being supposed by the inventor of the former to indicate the anterior end of something, and the retro- being substituted by him to indicate the posterior end. A 'retroceps' was an apparatus constructed to seize the breech. The use of this instrument is as incorrect as its etymology.

seventeenth century. Chamberlen's forceps (fig. 296) had the fenestra which has been retained in all patterns since, and a lock something like the one applied to the modern French pattern. Forceps have been found in collections of Egyptian surgical instruments, and therefore date originally from many centuries B.C.

The lock was at first only a pivot attached to one blade, and working in a hole in the corresponding place in the opposing blade, with a mortice on the apposed side of each blade, so as to allow of close fitting. The lock known as the English pattern was contrived by Smellie about the middle of the eighteenth century. It is the most readily adjustable lock of any yet invented, and is, when the forceps is applied to the head, quite secure. It is also the most easily kept clean of any pattern.

The forceps was short and straight at first, and the blades were adjusted to the child's head in the genital passages 'at random, taking hold of the head anyhow, pulling it straight along, and delivering with downright force and violence; by which means both os internum and externum (cervix and vulva) were often torn, and the child's head much bruised' (Smellie).

Smellie had an instrument made which obviated this, and introduced another great modification—namely, the addition of what is known as the 'pelvic curve.' This curve causes the blades, as seen in profile, to correspond to the curve of the pelvic axis. He says: 'In a narrow *Pelvis* I have sometimes found the head of the child thrown so much forward over the *Os Pubis*, by the jetting in of the *Sacrum* and the lower *Vertebra* of the loins, that I could not push the handles of the forceps far enough back, to include within the blades the bulky part of the head which lay over the *Pubes*. To remedy this inconvenience, I contrived a longer pair, curved on one side, and convex on the other. . . .'

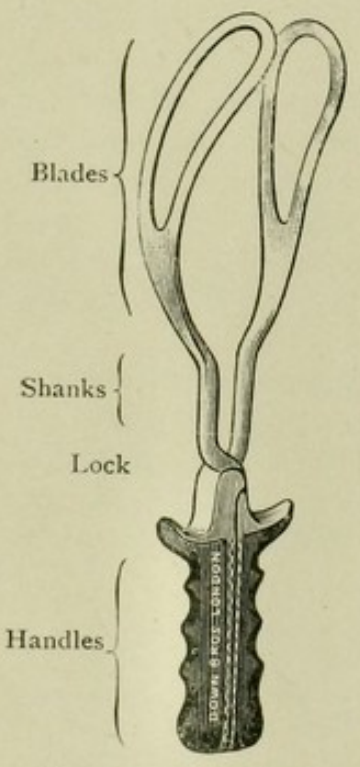

Fig. 297.—Simpson's long curved forceps.

In this pattern the cranial curve of the blades starts from the lock, an arrangement which is still found in the 'short forceps' of the present day, which is, however, an instrument rapidly becoming obsolete.

The lock had to be adjusted in the vagina on account of the shortness of the instrument, and this was likely to lead to nipping of the vaginal walls.

Simpson added a shank (fig. 297) to the blade, which enables the forceps to be applied to a head at the brim, and yet to have the lock outside the vulva. This pattern is called the 'long forceps,' and is the one which is used, in some slight modification or other, in all cases at the present time. Neither the pelvic curve nor the cranial curve affects the shank, which is straight and in a line with the handles.

The advantage of the pelvic curve is that it allows the head to be caught by the blades while they are lying almost in the axis of the brim, or of whatever plane of the pelvis is occupied by the greatest diameter of the

head, while the handles are in the axis of the outlet (fig. 317); it allows traction, as will be described, to be made in the axis of the brim or nearly so, by the hands alone, or completely so by the use of 'traction-rods;' it makes the introduction of the blades along the curved parturient tract easier than if they were straight; for the end of the blade is always the leading point as it advances, and not some point on the side of the blade, as would be the case if a straight blade had to be passed (figs. 298 and 299).

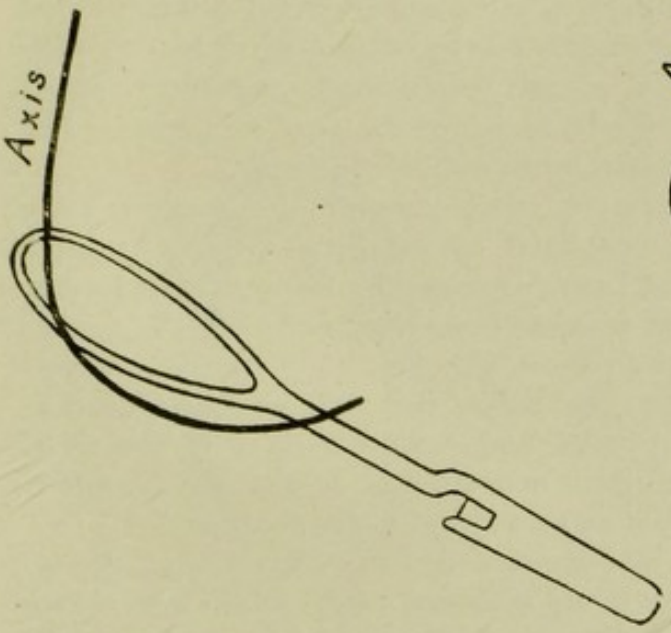

Fig. 298.—Showing disadvantage of long straight forceps in application.

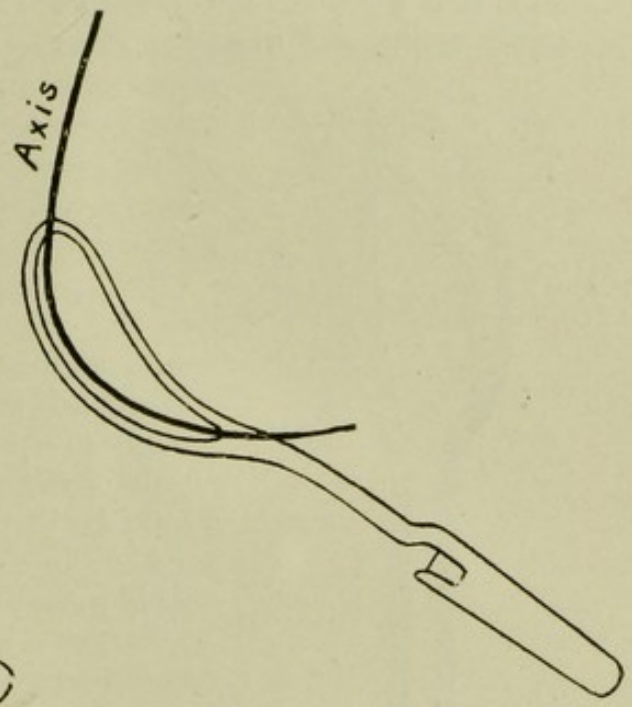

Fig. 299.—Showing advantage of curve in application of long forceps.

Modern long curved Forceps.—This instrument is made in several patterns, each of which has some advantage. It is, however, possible to combine their advantages in one pattern.

It is found that the most uniform pressure is obtained over the surface of contact with the head if the cranial curve forms the arc of a circle 9 inches in diameter. If the arc is of a smaller curve than this the pressure is not uniform, and the blades are more difficult to introduce; if of a larger circle, they are liable to slip off during traction. The tips of the blades are separated by about 1 inch when the forceps is closed, so as to prevent compresssion of the neck if this lies between the tips, and yet not to allow the head to escape; they will be somewhat wider apart when the head is grasped.

The distance between the widest points on the cranial curve is not more than $3\frac{1}{2}$ inches.

The length of the blade and shank together is about $9\frac{1}{2}$ inches; this allows the head to be seized above the brim while the lock is still outside the vulva. The length of the shank is about $2\frac{1}{2}$ inches. The pelvic curve of the blade, which is about 7 inches long, is one of 35°.

The handles are not less than 5 inches long, so as to allow of a firm grasp, and of power of compression sufficient to hold the head without the hands of the operator becoming readily exhausted. They should be of metal, so that they may be boiled; and should be deeply grooved to prevent slipping, and

not cross-patterned, for this renders them uncomfortable to hold, and makes them more difficult to thoroughly clean. The rigidity of the blades and shanks cannot be too great so long as they are compact. All the edges should be rounded, so that there can be no cutting or scraping of the fœtal or maternal parts.

In one form of forceps, that of Assalini (fig. 300), the two halves of the instrument do not cross at a lock, but are joined at the lower end of the handles. This is a great drawback to their value, for there can here be no sufficient compressing and grasping action exercised by the hands of the operator, since they are at a mechanical disadvantage; and most if not all of this has to be produced by the walls of the genital canal, being both uncertain in its amount and likely to cause damage to them. The instrument is also more difficult to apply.

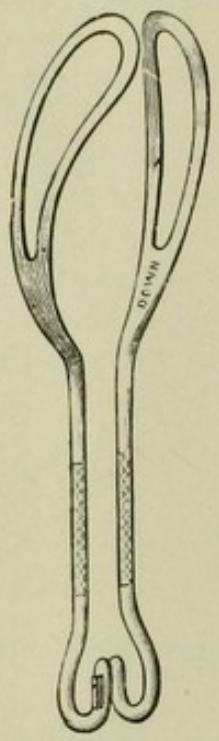

Fig. 300.—Assalini's forceps.

The patterns in most common use at present are two, the one contrived by Simpson (fig. 297), and a modification of Lever's forceps by Barnes. The former corresponds in measurement very nearly to the figures already given as most suitable. They have a flange on the handle just below the lock, which is used as a hold for the index and middle fingers of the right hand. The surface of the outer side of the handle is deeply grooved, so as to render the hold firm.

Barnes's modification is somewhat longer, the increased length being obtained by the addition of a loop above the lock into which the forefinger can be passed as a hold. Their somewhat longer shank enables the head to be easily grasped by the instrument when it is still well above the brim. The loop and the flanges can be combined in one (fig. 301), and this is probably the best pattern for ordinary use.

Axis-traction Forceps.—Every kind of long forceps, if properly used, should pull very nearly in the axis of that part of the pelvis through which it is desired to draw the head at the moment, but this action can be more accurately and powerfully produced by mechanical arrangements in the forceps itself. One way in which this can be attained is by affixing a rod to each blade about where it joins the shank, as in Tarnier's forceps. The two rods converge below, and are continued into a handle, to which is fitted a cross-bar. The rods and their handle, which together constitute the traction part of the instrument, form a curve, so drawn that the cross-bar is carried behind the posterior commissure of the vulva, and so that the traction is exercised in the line of the upper part of the blades (fig. 303). By this means direct traction is possible in the axis of the brim without any loss of power, such as is necessitated in pulling in this axis with ordinary long forceps. The handles are allowed to look after themselves until the head is almost on the perinæum, when they are used in the way to be described for ordinary long forceps. Since there is no grip of the head obtained from the hands during the early part of extraction, it is necessary that the blades should be kept applied to the head by some mechanical means. This is

provided by a screw, which unites the handles a little below the lock. The lock in Tarnier's forceps is of the French pattern.

The instrument is rather cumbrous, and owing to the many joints and interstices is difficult to keep clean. Several modifications (as fig. 302) of this, the original pattern, have been contrived which in a great degree do away with these objections. They all, however, have the disadvantage of compressing the head continuously during their application.

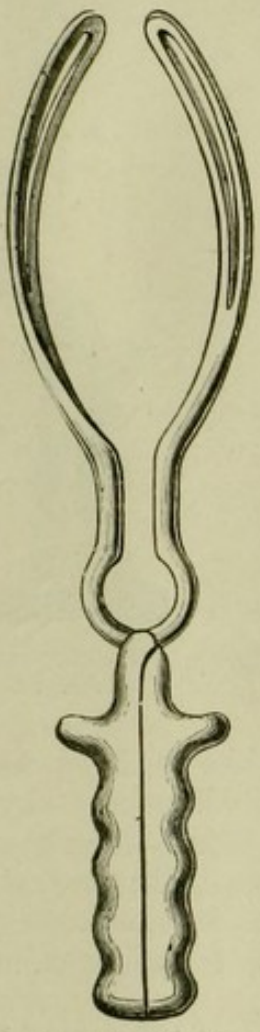

Fig. 301.—Combination of patterns of Simpson and Barnes.

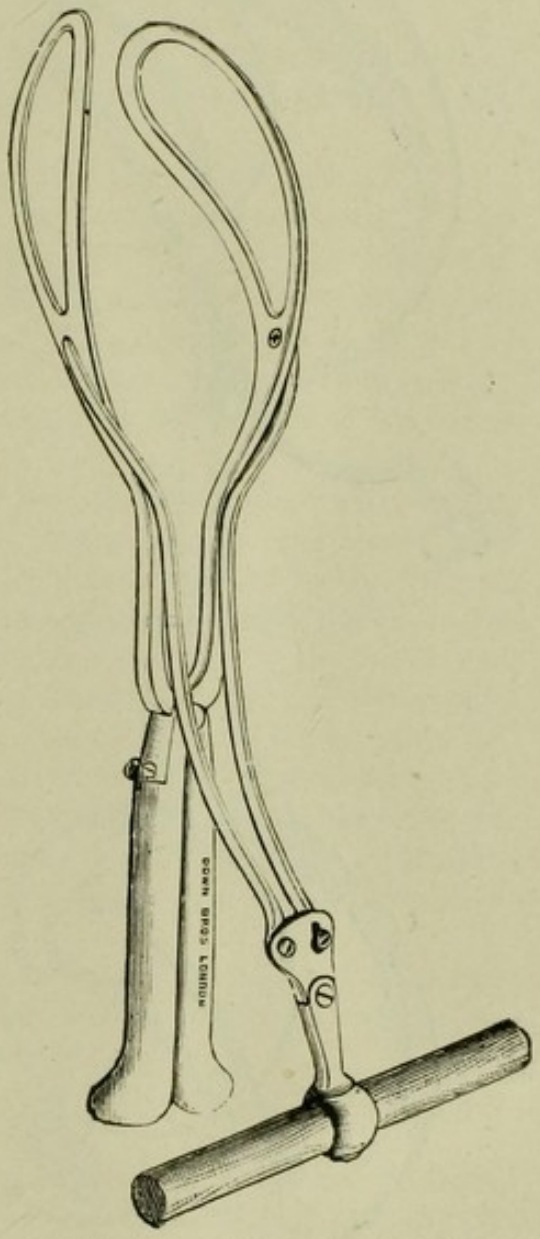

Fig. 302.—Axis-traction forceps. (Cullingworth's pattern.)

Another way of obtaining axis-traction with ease and without loss of mechanical advantage is by bending the handles back over the perinæum —the original plan of axis-traction employed by Johnston in 1769—or by making a bend in the shank, as in Galabin's (fig. 304), when the handles run in the line of the brim axis.

The use of the axis-traction forceps is practically confined to pulling the head through a contracted brim ; when the head has passed into the cavity

it is no better than the ordinary kind. It is only of use, therefore, to pull the head through a somewhat smaller brim than can be passed by the aid of the latter. In cases where the difficulty is so great as this, it is in all probability better to turn ; and this can be nearly always done, since the

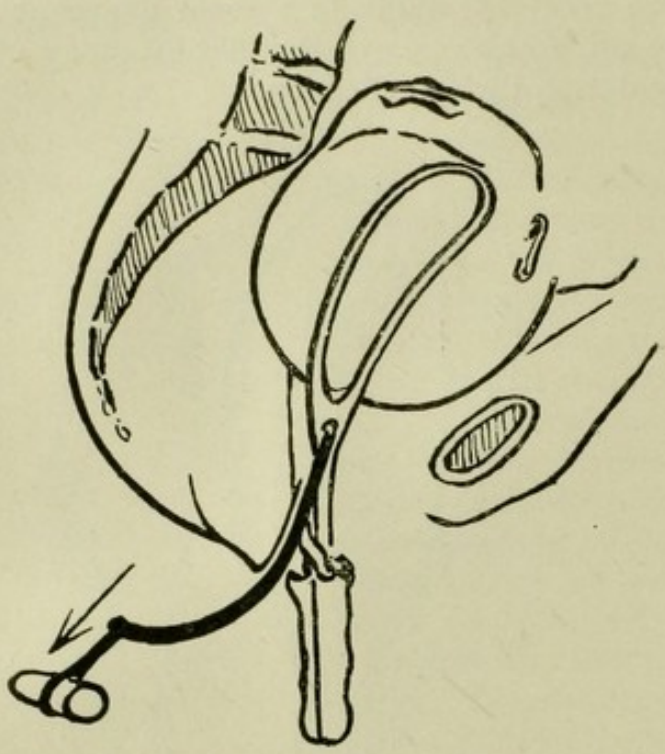

Fig. 303.—Axis-traction by rods.

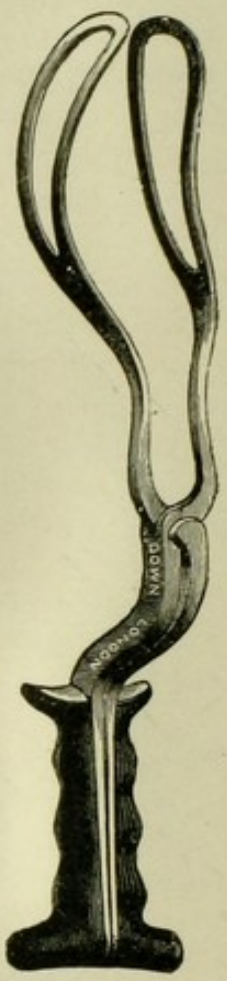

Fig. 304.—Galabin's axis-traction forceps.

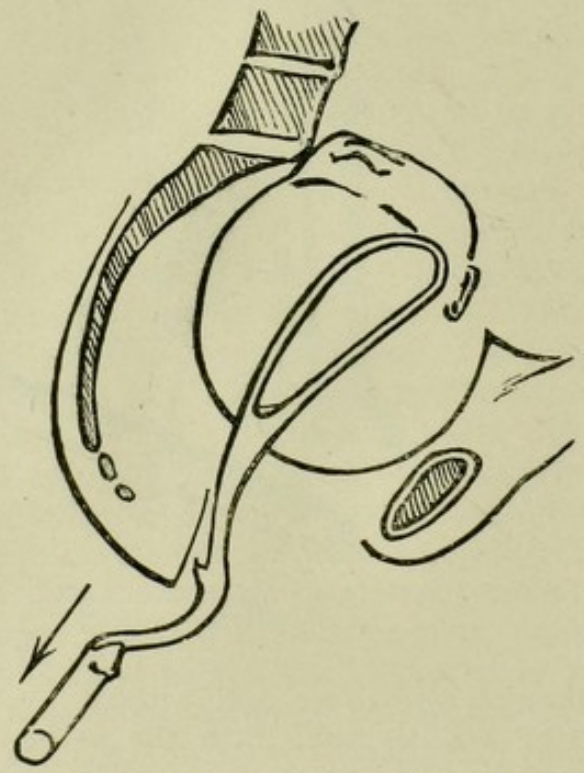

Fig. 305.—Axis-traction by perineal curve in the shank.

head will not have entered and become impacted in so small a brim. If impaction has occurred, then no doubt the axis-traction forceps is most valuable, if the forceps is applicable at all.

Conditions requiring the Forceps.—These are very numerous and varied. They may be divided into three classes :

First, where the pains are inefficient (see Inertia, p. 411).

Second, where the pelvis is abnormally small, the head is abnormally large, or the head is in a faulty position.

Third, where speedy delivery is necessary, as in placenta prævia under

certain circumstances, prolapse of the cord, eclampsia, or delay in the delivery of the after-coming head.

Each of these occasions for the use of forceps is treated of in the chapter dealing with the abnormality which makes it necessary.

Mode of Use.—Before the operation of extraction by the forceps is begun, the following points are to be attended to :

The bladder and, if there is time, the rectum are to be emptied.

The membranes must have been ruptured.

The cervix must be dilated to at least three-quarters of the full degree, and must be dilatable to the full extent without the employment of any considerable force.

The lie and presentation of the child must be accurately made out.

The reasons why the membranes must be ruptured are obvious. If the forceps is applied to the head while they are still intact, either a piece of membrane must be torn off before the head can be drawn down, rendering increased force necessary, or the whole of the ovum must be dragged out at once, which involves a separation of the placenta and considerable bleeding ; with the birth of the child in an unruptured sac, and the danger of its being asphyxiated.

The os must be dilatable to the full degree, or it will be much torn, and the extraction will also be difficult. It is never necessary to apply the forceps through an undilated os, for if the head is able to be extracted by the forceps at all it will come down into the lower segment, and will dilate the os in the absence of the membranes. The only exception to this is the rare case where the membranes have for some cause ruptured early, and the uterus becomes over-retracted or tetanic ; and in this case it might possibly be advisable to risk the cervix for the sake of saving the woman from her dangerous condition. The practice of extracting the head through an undilated os has been shown by the statistics of the Rotunda Hospital, where a special pattern of forceps was contrived for this purpose, to have doubled the mortality.

The child must not be extracted from an exhausted uterus by the forceps (see p. 412) ; and the amount of contraction which makes a pelvis suitable for the application of the forceps is discussed later (p. 442).

The instrument is to be made aseptic, and the vagina douched with a disinfecting solution.

An anæsthetic should be given whenever possible if the head is above the brim, and also if the woman is very nervous or excitable, but not to the full degree.

The best position for the patient is the left lateral one, for reasons already given, and she must be brought near to the edge of the bed, so as to render the introduction of the upper blade possible. The thighs are to be well flexed on the belly.

The routine then is :

1. Confirm the diagnosis.
2. Take the lower blade, previously warmed and lubricated.
3. Pass two fingers of the left hand up to the child's head, so that the tips lie between the cervix (or the vaginal wall if the head is below this) and the head.

4. Pass the lower blade into position.

5. Pass the upper blade.

6. Lock the blades.

7. Make a trial traction, to see if the head is well grasped and the forceps does not slip.

8. Pull during the pains in the axis of the canal occupied by the head.

9. When the head has reached the perinæum, take off the forceps, unless there is any reason for speedy delivery, or

10. If delivery is to be completed by the forceps, change the position of the right hand, and use the left hand to help the head over the perinæum.

1. *Confirmation of Diagnosis.*—This is done now so as to be sure not only that no mistake has been made in the relation of the head to the pelvis, but also to see that the condition of affairs is not altered since the last examination ; the head, for instance, may have advanced sufficiently without help to make extraction unnecessary.

2. *The lower blade is taken first*, because the construction of the lock makes the handle of this blade come posterior when both blades are locked (see figs. 310 and 316). The blade which is passed first must be held out of the way whilst the other is being passed, and the one of which the handle has to go behind in locking is the most suitable for being held out of the way for two reasons : (*a*) there is more room for a handle or shank behind, for the perinæum will stretch without pain, and allow of the handle lying back ; and (*b*) if the handle of the blade first passed has to be carried forwards the blade is partly withdrawn off the head in so doing, and tends to slip backwards into the hollow of the sacrum. Carrying the blade backward has the opposite effect to this, for it causes the blade to rise in the pelvis and tends to keep it well forward over the head.

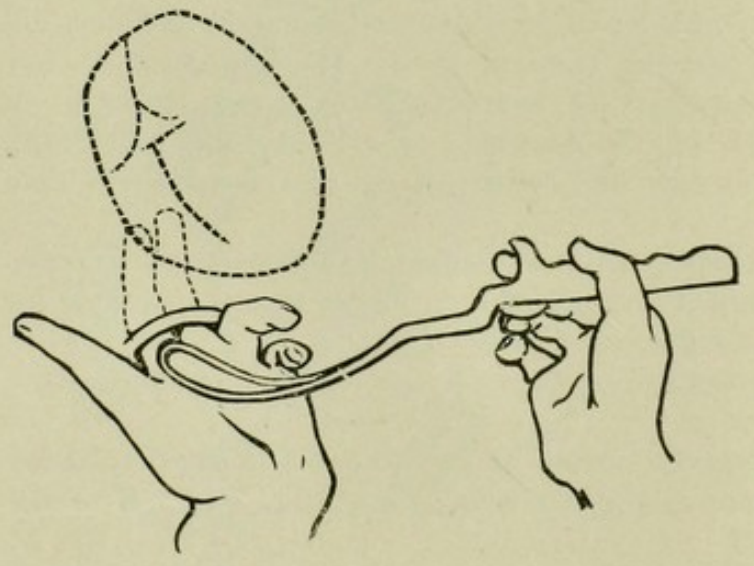

Fig. 306.—Introduction of lower blade.

There is always a tendency for the blades to turn in the pelvis so that their cranial curve lies along the front of the sacrum ; this tendency is due to some extent to the elasticity of the perinæum, and is best avoided by carrying the handles well back.

A very good lubricant is pure soft soap, carrying 5 per cent. carbolic acid.

3 & 4. *The fingers are passed* as described in the 'routine,' and the lower blade is then taken in the right hand, which holds it in a horizontal position, and with its pelvic curve continuous with that of the sacrum (fig. 306). The concavity of the cranial curve will thus be looking upward (to the woman's right acetabulum). The blade should not be grasped with the fist, but held lightly with the thumb and the first two fingers. When the blade is almost through the vulva, it is to be rotated so that the concavity of the cranial curve

looks towards the woman's head (fig. 307). The handle is then raised, and the blade is pushed gently on—being insinuated rather than directly pushed—

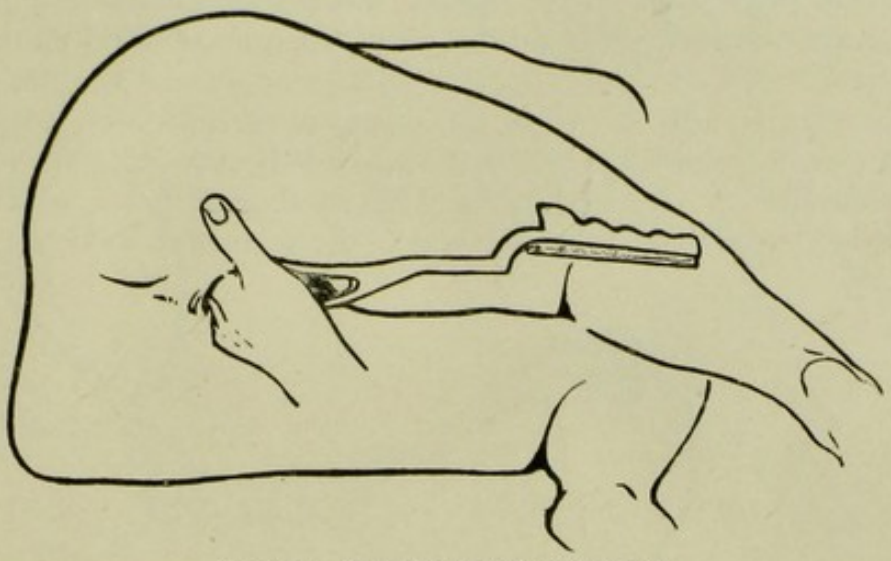

Fig. 307.—Introduction of lower blade.

and rotated gently on its own axis so that the concave surface of the cranial curve looks upwards (to right acetabulum) again. All these three movements—

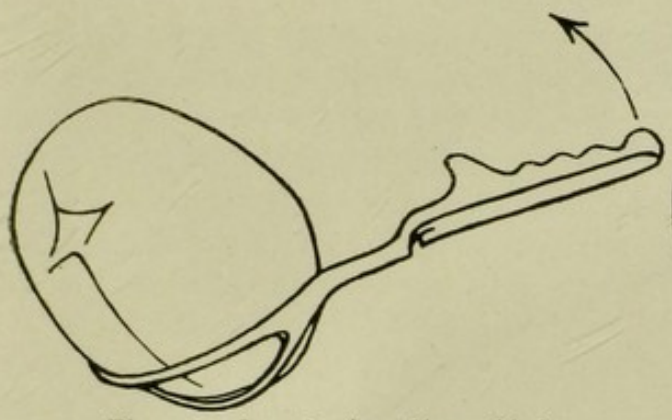

Fig. 308.—Introduction of lower blade.

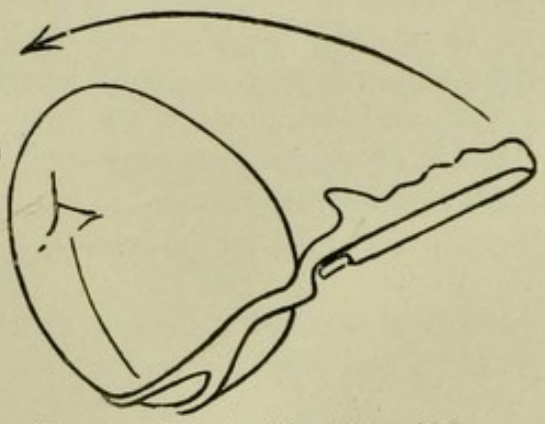

Fig. 309.—Introduction of lower blade.

namely, the onward one, the *tour de maître*, and the rotation—are going on at the same time (figs. 308, 309, 310). Since a semicircle has to be described

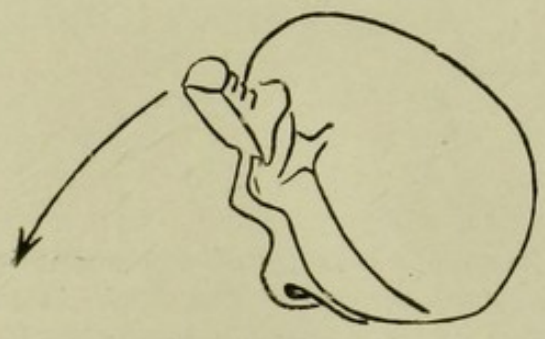

Fig 310.—Introduction of lower blade.

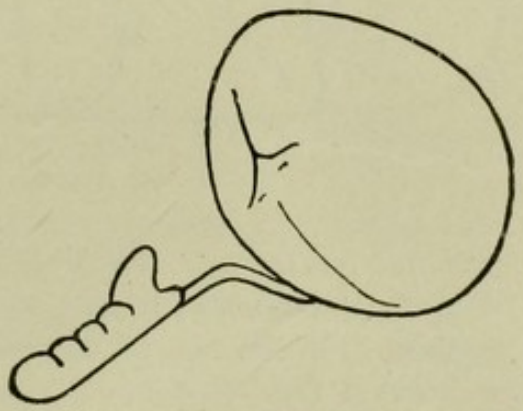

Fig. 311.—Introduction of lower blade.

by the end of the handle so as to enable the point of the blade to travel round from the sacral aspect of the head to the lateral, the last part of the

path of the end of the handle is in a downward direction (figs. 310, 311); and this should put the blade in its right position at the side of the head.

The blade often slips in for the last few inches without any help, and it has gone to its proper length into the canal when it is buried up to just short of the lock.

The handle is now given to an assistant to hold well back into the perinæum; or, if there is no assistant—and it is best to learn to work without one—this handle can be rested on the wrist of the left hand, which must be as extended as possible, and the elasticity of the perinæum will keep the handle

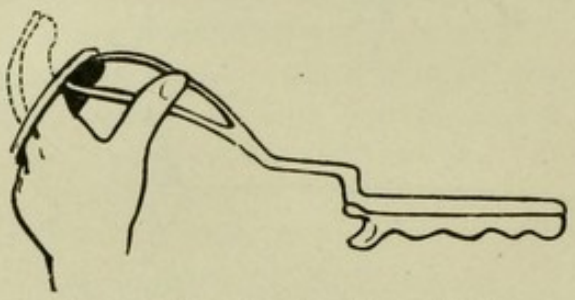

Fig. 312.—Introduction of upper blade.

pressed against this firmly enough to retain it in its place while the fingers are passed into the vagina to guide the upper blade.

In passing the blades of the forceps the tip is on no account to leave the palmar surface of the fingers of the left hand until it is well inside the cervix, and lies between the fingers and the head with nothing intervening. This is of course very important where the forceps is used to deliver in the case of placenta prævia.

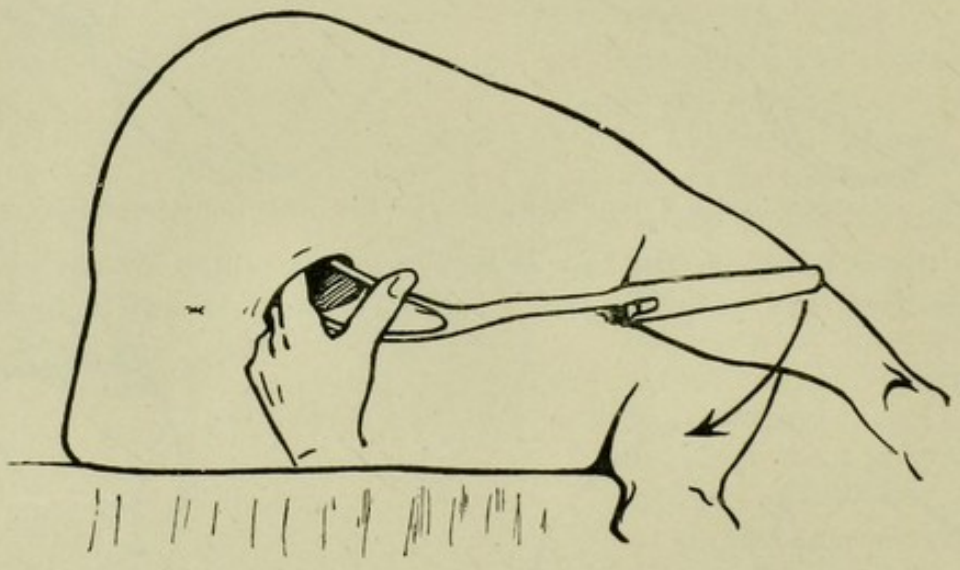

Fig. 313.—Introduction of upper blade.

5. *In the insertion of the upper blade* the same character of movement is required as in the case of the lower, but in a reverse way. The blade is to be held in the same manner as the lower as regards grip, and with its pelvic curve in line with the curve of the sacrum as before. It is introduced through the vulva in the same way. Then, instead of the semicircle described by the end of the handle being convex upwards, it is convex downwards. So that the first direction in which the handle sweeps is downward

(fig. 314), and this movement requires that the tip of the handle shall go below the level of the surface on which the hips are resting. Hence the necessity for the woman to lie quite at the edge of the bed; and it is important to have her there to start with, for there is some danger in moving a woman while the handle of a blade is projecting from her vulva.

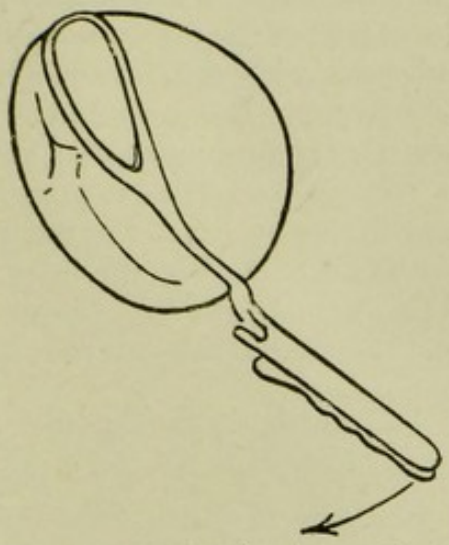

Fig. 314.—Introduction of upper blade.

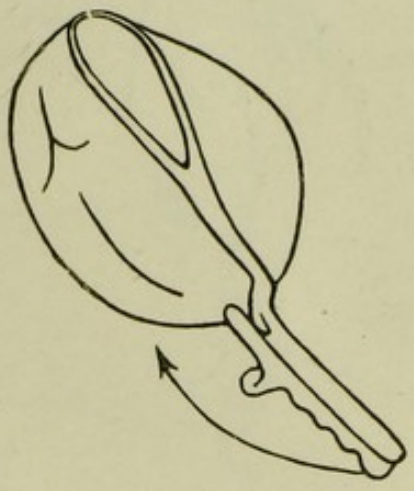

Fig. 315.—Introduction of upper blade.

The rotation of the blade as it enters is also inverted (fig. 315); the cranial curve has to be rotated so as to look downwards at the end of the movement of introduction (fig. 316).

6. When this blade is in as far as the lock its handle is to be carried back to that of the lower blade, and *the two blades are then to be locked* by depressing the handle of the upper blade slightly, so as to allow the flange on that of the lower to pass over.

If it is found that the blades will not lock, one of them must be further in than the other; or they are not opposite each other, owing to one or both having moved towards the hollow of the sacrum. In any case it is not well to force the blades about in trying to get the locks opposite to one another, for the vagina or the scalp may be lacerated in so doing; but after gentle and unsuccessful efforts to get them into apposition, the right course is to withdraw one or both and reintroduce them.

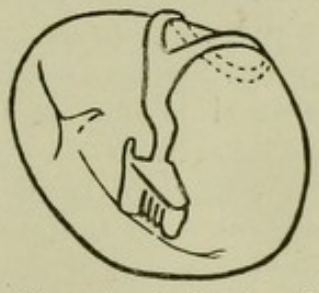

Fig. 316.—Application of upper blade.

7. *Trial traction* is made to see if the head is properly grasped. In some cases where the centre of the head is rather forwards, as, for instance, in the rarer form of mechanism of occipito-posterior positions (fig. 173, p. 147), the occiput may be the only part lying in the way of the blades, and they will at once slip off this. The test is made by grasping the handles with the right hand, and passing the finger of the left up to the head. If traction is now made any slipping will be discovered.

8. *Traction is to be made in the axis* of the brim, supposing the head to be at the brim. It is best done by arranging the hands in the way described by Galabin. This is on the Continent called Pajot's manœuvre, since that author described the method independently of Galabin. If traction is

made by each hand in the line of its forearm as in the diagram the resultant of the two forces will be one very nearly in the axis of the brim.[1] In practice it will be found that nearly all this force will have to be used by the left hand, as in fig. 317, the right hand acting rather as a fulcrum. As the head descends in the pelvis the use of the left hand at the lock becomes less and less important, since the lower part of the pelvic axis corresponds more and more with the line of direct traction by the forceps. The pull should be made during the pains as far as possible, so as to merely assist the process of expulsion, and not to empty the uterus too fast for the probable rate of retraction. During the intervals of pulling, the handles should be allowed to separate slightly, so as to relieve the head from continuous pressure.

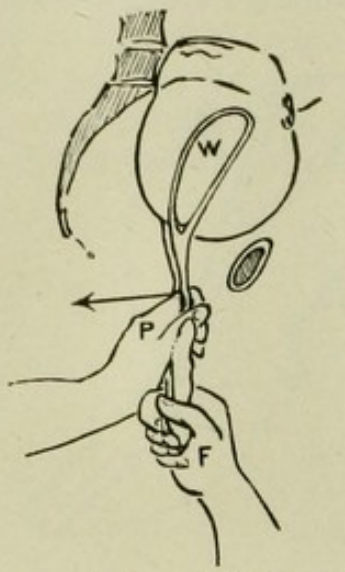

Fig. 317.—Action of left hand in producing axis-traction. *F*, fulcrum; *P*, power; *W*, weight. The onward movement produced by traction by the right hand is not here indicated.

9. If contraction of the brim is the only obstacle to delivery and there is no urgency, *the forceps can be taken off* when the head is nearly on the perinæum, and the rest of the expulsion left to nature. It is better to do this, wherever it is possible, as it allows of proper retraction of the uterus, and of complete dilatation of the perinæum. To take the blades off, they are allowed to fall apart, when they can be unlocked and taken out one at a time, with as much care as was exercised in their introduction.

10. *If delivery is urgent it must be completed with the forceps.* The head is now on the perinæum, and the handles of the forceps are pointing almost directly forwards. The right hand is to be shifted round the end of the handles till it holds them as shown in the diagram (fig. 318); this is done without letting go. The left hand has been taken off, and is now placed on the perinæum as it is in the conduct of an ordinary vertex presentation in a normal labour (p. 190); it is used to push the head forward against the pubic arch so as to take as much pressure as possible off the perinæum.

The right hand now carries the handles round in front of the mother's abdomen, so that the curve of the blades still corresponds to the curve of the lower end of the genital canal. The traction is thus made forwards and slightly upwards at this stage.

The use of the left hand should be attended to throughout extraction, for this hand plays a very important part—first, in producing axis-traction; and then in backing up the perinæum.

Tarnier's axis-traction forceps is applied in the same way as the ordinary kind, except that just as the two halves of the lock are approached to one another, the traction-rod of the upper blade must be lifted over the handle of the lower one so as to lie behind this with the rod belonging to the latter. The screw of the lock is then put together, and screwed up moderately

[1] Galabin, *A Manual of Midwifery*, p. 567.

tightly; the rod and screw below the lock is screwed up so as to hold the head firmly without compressing it more than is necessary; the cross-bar is fitted to the united ends of the traction rods. Traction is now made as described on p. 374.

In cases where the forceps is to be applied to the after-coming head, which is in these cases nearly always on the perinæum, the child's body is carried as far forwards as possible, and there is then no difficulty in adjusting the blades according to the principles already described. During extraction the handles are to be kept close to the child's body, for this will aid in maintaining flexion of the head.

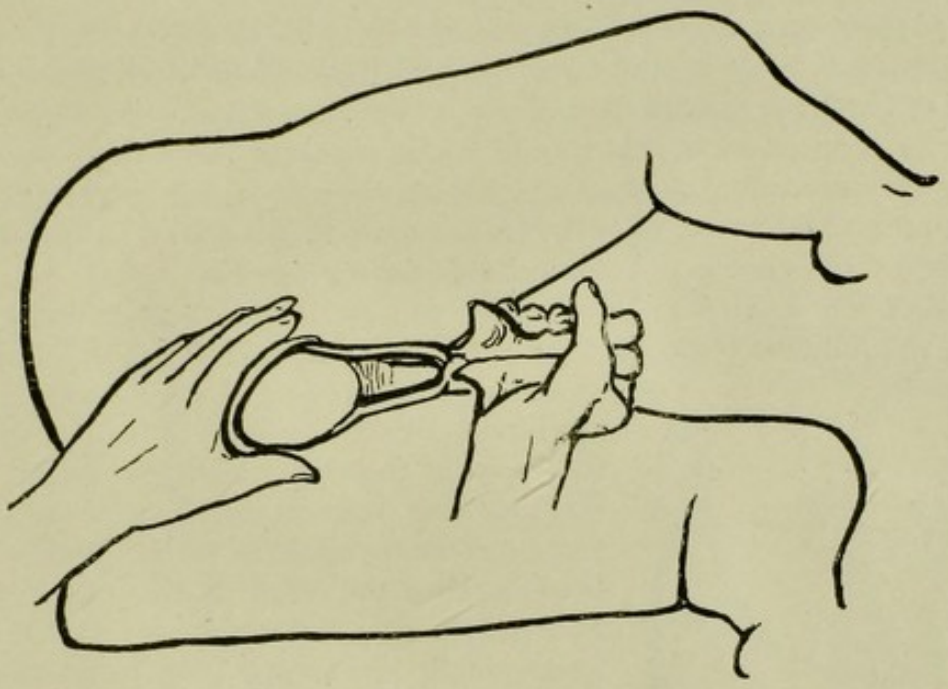

Fig. 318.—Extraction over perinæum.

Theory of the action of the forceps.—The forceps acts on the head of the child in two ways; as a *tractor*, and as a *compressor*. It cannot act as a tractor without compressing the head sufficiently to obtain a hold; but it can of course compress the head without any locomotive action.

Compressing action.—Compression of the head is produced by two forces acting on the forceps; (1) the inward pressure of the sides of the pelvis and the soft parts; and (2) the compressing power applied to the handles.

Assalini's forceps depend entirely on the former factor, and is bad on that account alone; for it is obvious that the less extra pressure that is applied to the walls of the parturient canal during labour the better. Pressure by the handles is under the control of the operator, and can be made more powerful at his will, helping to mould the head in some degree where necessary.

The distance between the widest part of the blades is about $3\frac{1}{2}$ inches, and the diameter grasped is from $3\frac{1}{4}$ to 4 inches; so that the handles are kept somewhat apart by the head lying between the blades until they are compressed by the hand, and then a reduction in the diameter of the head grasped can be made of about $\frac{1}{4}$th to $\frac{1}{3}$rd of an inch. If the compression is exercised slowly it can be carried to this degree without any danger.

Traction.—This necessitates compression to the degree necessary for

gripping purposes; for unless the cranial curve of the blades exactly fits the head, the latter will without compression slip out of their grasp. Foreign patterns have most of them a sharper curve than English ones, and they incur the danger of nipping the neck or the skin between their tips.

In using the forceps in which the compressing force is entirely controlled by the hands, and not rigidly fixed by a screw as in Tarnier's, or dependent on the reaction of the walls of the passage as in Assalini's, it will be seen that greater compressing force is exercised when greater extracting force is used: the second action, in fact, varies as the first, which is the most desirable arrangement possible.

The amount of force which may be safely used in extraction lies within fairly wide limits; but it may safely be said that a man of ordinary strength should not put forth his full power for more than a few seconds at a time, and that such an effort as this should not be repeated more than two or three times, or very considerable damage will be caused to the mother's parts as well as to the child; and, in fact, if more than this is found to be necessary for extraction the case is not one suitable for the forceps.

Oscillatory movements.—Extraction can be helped by oscillatory movements of the handles of the forceps. These movements have been described as the leverage action of the forceps, and they are instances of leverage. It is best, however, to leave out the term 'leverage action' in describing the uses of the instrument, for this term has been applied to the action of one blade against the other at the lock considered as a fulcrum by some writers; and there has been much confusion. The usual movement is one from side to side with reference to the pelvis, but it may be made in an antero-posterior plane. Its advantage may be explained as follows. If the handles are swung from the right side towards the left, the side of the head in contact with the left blade of the forceps being fixed against the pelvic wall of that side, it will be readily seen that the right side of the head will describe a part of a circle in a downward direction round the fixed left side as a centre. A bent lever is formed, the power B being at the handles, the fulcrum D being fixed against the pelvic wall, and the weight A being the opposite side of the head (fig. 319). If at the end of this movement, the head is now fixed against the right side of the pelvis, and the handles are swung to the right, the left side of the head will descend in the same way.

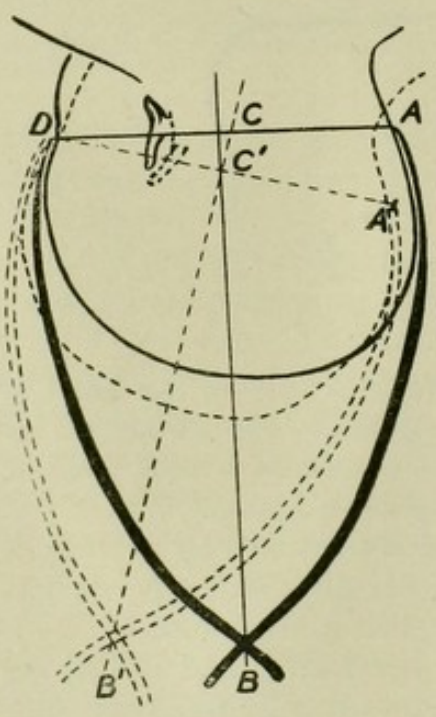

Fig. 319.—Showing mechanical advantage of oscillation. *D B A*, first position; then, on moving *B* to *B'*, the head revolves round *D*, brings *A* to *A'*, and centre of head *C* to *C'*; *A'* next becomes centre of revolution as the handles are swung back to *B*.

If one side is not fixed, and moves up on oscillation as much as the other side moves down, the fulcrum being about the middle of the head, no advance of the head takes place, and the manœuvre is useless except that it produces

dynamical instead of statical friction (friction between moving surfaces instead of between stationary ones), and as in any given case the former is less than the latter, there is a slight advantage.

The movement is of no use where there is direct opposition to the advance of the head, as where the brim is too small to allow of engagement; so that it is of no advantage to employ it before the head has entered the brim. If a head is gripped by a contracted conjugate it is of no use to swing from side to side, but the plane of oscillation must be antero-posterior. The manœuvre must not be continued unless there is some advance, for there is always danger of damaging the soft parts in contact with the head.

It has not been advised here that any attempt be made in applying the forceps to accommodate the blades to the sides of the head or to any of its diameters, but that they should be applied with reference to the pelvis. This is much easier, at all events, until some experience has been acquired, and

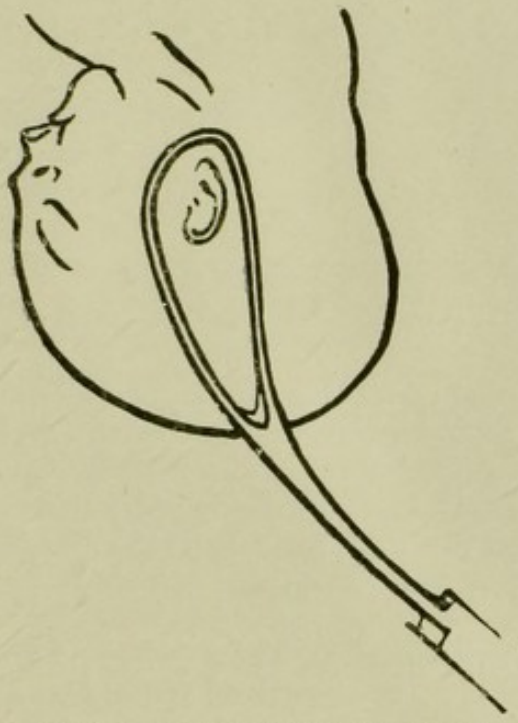

Fig. 320.—Ideal application of forceps.

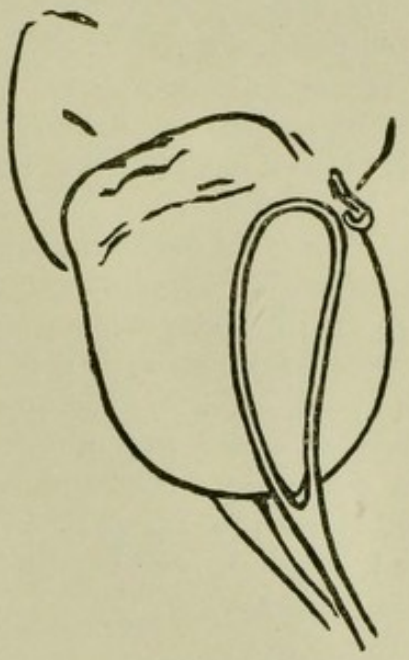

Fig. 321.—Usual relation of forceps to head.

there is practically no disadvantage. If the head lies transverse at the brim, as is common in flat pelvis, the value of the pelvic curve of the forceps, if applied to the sides of the head, is evidently lost.

When the head has rotated into the antero-posterior diameter, as it comes near to the outlet, the sides of the head correspond pretty well to the sides of the pelvis; and in applying the forceps it is easy to pass the blades so that the bi-parietal diameter, or one near it, is gripped (fig. 320). When, however, the head is at or above the brim the head lies obliquely, and the blades will be one at each pole of a diameter lying between a parietal tuberosity of one side, and the temporal ridge on the other (fig. 321).

In a flat pelvis the forceps will be found to have been applied to the fronto-occipital diameter. In delivering the head through the pelvis in this case, if it is necessary to pull it all the way through, the forceps should be allowed to relax their hold in the cavity, so that the head may rotate within the blades, which it will readily do. It is still better to take the blades off altogether

when the obstruction is at the brim only. In ordinary cases, if the operator pleases, he may make an attempt to get the blades on the sides of the head, by bringing them into a diameter slightly removed from the transverse ; for instance, when the head is lying with its long diameter in the right oblique the blades should oppose one another in the left oblique. There is really not much gained by this, since a slightly oblique grip of the head seems of no disadvantage. If it is considered to be so, the head may be allowed to rotate in the forceps as just mentioned in the case of flat pelvis.[1]

Vectis

The vectis or lever is something like one blade of a straight long forceps. It is, however, much more curved towards the tip, so that it may obtain a hold on the end of the head to which it is applied.

Its use is to bring down one pole of the head. Its hold is obtained almost entirely by friction, for it is pressed against the head by the reaction of the pelvic wall.

It was in former times used to extract the head when there was delay just before the head distended the perinæum, or sometimes earlier than this. It is only of use after the head is engaged. As is pointed out by Galabin, it may be used to bring down the occiput when deficient flexion leads to non-reduction of an occipito-posterior position, or to bring down the chin in the corresponding mento-posterior difficulty. It might be used to bring down one pole in brow-presentations.

The Blunt Hook is made of a piece of steel rod continued into a handle below, and curved at the upper end into a hook about two inches in spread. It is used mostly to pull down a child presenting by the breech, being passed over one groin. Its employment is best reserved for the cases where the child is dead (see p. 474). With a flexible stem the hook is useful in some cases requiring version (p. 369), and in certain instances of unduly large child (p. 463).

CHAPTER LI

Obstetric Operations (*continued*)—Embryotomy

Craniotomy

Definition.—In this operation the size of the fœtal head is diminished by removing the contents of the vault, and sometimes the vault itself, and then, if necessary, crushing or in some way diminishing the base.

The object is to reduce the diameters obstructing delivery.

[1] *Application of the short forceps.* This instrument is practically never used now, for the long forceps are quite applicable at the outlet, and there is no need to add to the midwifery bag. The blades are applied much as those of the long forceps, except that they are accurately adjusted to the side of the head. They have no pelvic curve, and no shank.

Conditions requiring the Operation.—Certain *faulty relations of the ovum and parturient canal*—(*a*) in size ; contracted pelvis (p. 442) ; growths and cicatrices of the soft parts ; hydrocephalus ; some monsters ; and some cases of locked twins ; (*b*) in position, persistent mento-posterior face cases. It may also be necessary where *rapid delivery* of the mother is desirable and where extraction cannot be effected quickly enough by the forceps, and in the case of *dead children* where there is more than a slight obstruction to delivery.

This operation, of course, involves the destruction of the child by the operator ; but in all cases it is necessary to operate at once when it is decided that it ought to be done, for there is no merit in allowing the child to die where death must inevitably occur, when during every minute the operation is delayed fatal harm is being done to the mother. In Protestant countries the life of the mother is never imperilled for the sake of that of the child, whose survival is in any case problematical. In Roman Catholic nations the feeling is different, and some risk is admitted to the mother for the sake of bringing a living child into the world.

Method of Operating.—The steps in the operation are as follows : The head is first *perforated*, so that its contents may escape and it may collapse ; it is then, if necessary, further reduced in size by *crushing its base*, or by *removing some of its vault* ; and it is finally *extracted*.

Perforation.—The best *perforator* is the one contrived by Oldham, which allows of a firm hold in all movements of the instrument. The blades enter the skull to the depth of the shoulders on their sides, and are then separated by pressing the handles together.

Fig. 322.—Oldham's perforator, blades separated.

The os must be sufficiently dilated to allow the head to be extracted—that is, to about three inches in diameter, or after perforation delivery may be a most tedious and dangerous process.

The woman should be anæsthetised unless there is great urgency, for it is essential that she should be quite still during the operation, and well that her feelings under the circumstances should be spared.

The first two fingers of the left hand are passed up to the head, on the most central and prominent part of which they are to be made to impinge. The perforator, closed and grasped at the point where the shanks meet between the handles by the opposed thumb and the palmar surface of the first two fingers, is then guided up to the head, the surface of which it must meet at right angles. Its direction should be as much in the axis of the brim as possible, so that there is no chance of the point slipping off the head and wounding the mother. The child is firmly fixed by an assistant, who presses on it from above, and the point is bored into the skull—not jerked, for this would risk a slip. The instrument is then pushed home to its shoulder ; the handles are pressed together, the left hand keeping the instrument in

position, while the right changes its grasp. The perforator is then allowed to close again, and rotated through a right angle, again opened, so as to make a cross tear in the bone, and then passed down into the base of the skull so as to destroy the medulla. This last movement is made so as to prevent the possibility of the child's crying after it is born, and also to smash up the brains and membranes, that the contents of the vault may escape completely. It is not good to perforate through a suture, for the perforation is liable to close, having opened by the elasticity of the membrane joining the edges of the bones ; but it may be done through the anterior fontanelle, since the flaps of this will keep apart after being torn. It is usually considered best to perforate through one of the parietal bones. The brain substance may be collected in a receiver. There is, as a rule, no need to wash the contents out.

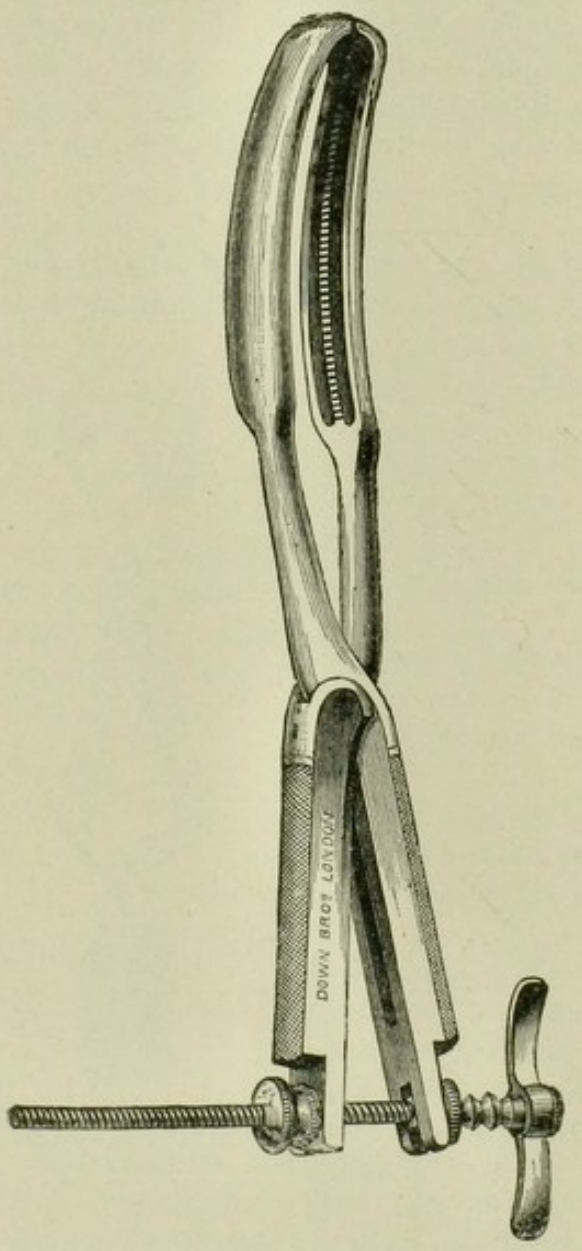

Fig. 323.—Hicks's cephalotribe.

Perforation is sometimes done with a trephine constructed for the purpose, but the free escape of the brain-substance is just as well secured by means of the perforator, and in a shorter time.

Extraction after Perforation.—There are several methods of doing this. The ones in most common use are : (1) by the cephalotribe ; (2) by the craniotomy forceps, used as (*a*) a simple tractor, or (*b*) as an instrument for removing the vault of the skull (cranioclasm), such removal being followed by the induction of a face-presentation.

Other methods of extraction are : by the crotchet, by Oldham's vertebral hook, or by version.

The Cephalotribe.—This instrument is something like a solid-bladed forceps, very much narrower in the blade, and with a flatter pelvic curve. The tips of the blades come into contact with one another, and the outside thickness of the instrument when the blades are screwed up tight is about one and a half inch. The pelvic curve is flat so as to allow of rotation of the instrument in the pelvis after the head has been crushed by it. The head is crushed between the blades, which are approximated by a screw at the end of the handles. They should be as rigid as possible, so as not to waste any of the crushing action. There is no object in lightening this instrument and

so involving loss of strength ; but it must not be made too thick to pass through the space available. The best pattern is that of Braxton Hicks, for it unites all the necessary characters. The blades of this are merely roughened, so as to prevent slipping on traction, and are grooved longitudinally, so as not to allow of lateral escape of the head. The grooving also makes the instrument a little lighter. The lock is the same as that of the forceps.

The blades are introduced in the same way as those of the forceps, the lower blade first. It is essential that the blades include the centre of the head between them, or there is some risk of slipping. If the position of the head in the pelvis is accurately made out, this can be done fairly easily, but Herman recommends, as an additional precaution, that the ends of the blades be felt through the abdominal walls, so as to be sure of their relation to the head ; and then if not in place they may be moved backwards or forwards by the handles. The head is to be fixed by an assistant, unless it is still firmly impacted after perforation. The lock will be just outside the vulva, and the blades are now to be screwed up as close as possible. The head will have been seized in the transverse diameter of the pelvis, just as in the case of the forceps, and may have been squeezed so that it bulges in the conjugate. This bulging is in any case very slight, and probably hardly ever occurs. As, however, the smallest diameter is now that one compressed by the blades, it is of great advantage to be able to rotate the instrument through a quarter of a circle, and so bring the crushed diameter, which if the blades are screwed home is not more than 1½ inch, including everything, into the conjugate, this probably being the diameter which is causing the obstruction. This rotation is allowed by the flatness of the pelvic curve ; and if this were as great as that of the forceps, such rotation would be impossible.

The head is now to be extracted slowly, and always in the axis of whatever part of the genital canal it occupies.

It is recommended by some that the head should be repeatedly crushed in various diameters before extraction is begun ; but this is as a rule quite unnecessary.

The advantages of the cephalotribe are that it holds the head firmly ; causes no risk of laceration of the maternal parts by spicules of bone ; and can be used in almost any pelvis which has a conjugate of not less than two inches.

Craniotomy Forceps.—This instrument may be used, as already mentioned, as a tractor merely, or as a cranioclast.

A. When used as a Tractor.—For this purpose Barnes's instrument (fig. 324) is the best, as it is provided with an approximating screw attached to one of the handles, and by its means a firm grip of the head can be obtained. There are two separate blades, and the lock should be of the English pattern. The instrument shown in the diagram has a French lock. The blades are curved, one convex and the other concave, to correspond to the curve of the skull, the blade which is convex inwards going inside the skull, and the other outside the scalp. Their inner surfaces are roughened, and should be exactly parallel to one another, since thus the entire

amount of tissue included between them is pulled upon, and not merely a part, and so there is less chance of their tearing away when traction is made.

The blades are guided in by the first two fingers of the left hand, the outer blade first. This is passed between the cervix or vagina and the scalp, being of course outside the latter. It is passed first because it is held by the surfaces between which it lies ; and both hands are free to apply the second blade, which goes through the hole made by the perforator. In addition to the scalp the blades include some bone of the vault. A parietal bone should not be the one thus gripped, for it is not firmly attached to the base of the skull, and may tear away ; but if possible the frontal bone should be caught, as this is part of the base of the skull, and is more reliable than the occipital bone, the squamous part of which is only attached to the basilar part at this date by cartilage and membrane.

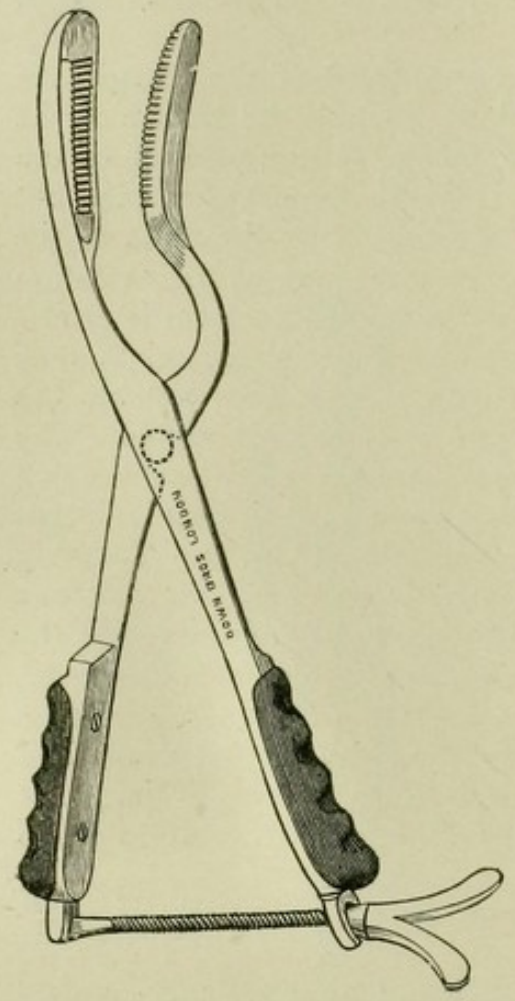

Fig. 324.—Barnes's craniotomy forceps.

The head when seized is pulled down in the axis of the part of the pelvis in which the head lies. The head elongates, and narrows considerably, and so it accommodates itself to any distortion of the available space in the pelvis.

B. When used as a Cranioclast.—Cranioclasm means breaking up and removing the vault of the skull after perforation. The object of the operation is to remove all the bone down to the base, which can then be tilted on its edge, and pass through the narrowed pelvis like a button through a button-hole.

The best patterns of craniotomy-forceps for this purpose are those which are closed by the hand alone, and not by a screw ; the instrument is used much as a bone-forceps.

In this mode of use the outer blade is inserted between the scalp and the skull, so that the bones of the vault can be removed in pieces under cover of the scalp. When a portion of bone has been seized, it is twisted off, care being taken to prevent, with the fingers which have been used to guide the forceps into position, the mother's parts from being wounded in doing this. The fragment is then drawn down the vagina with the same care. When the whole of the vault has been removed in this way, so that only the base is left, a face presentation is to be induced by bringing down the chin with a crotchet (caught beneath it or caught in the orbit) if one is to be had : or with a blunt hook ; or with the hands ; and then the craniotomy forceps or the cephalotribe is applied to the base, one blade passing under the chin, and the other over the exposed floor of the skull. This further diminishes

the mento-glabellar diameter (p. 95), which is the one to come into relation with the conjugate after cranioclasm.

It is said to be possible by this means to extract a head through a smaller pelvis than it is by the cephalotribe; but the operation is a very tedious one, and involves more manipulation of the parts, and more frequent introduction of the hands and instruments than any other obstetric operation, and it is therefore a dangerous one for the woman.

Version.—After perforation, when the uterus is still unretracted, version will in pelves of not great contraction deliver the child with ease. The head enters inverted, and so readily collapses. The disadvantages of version are that there are the manipulations of turning to be first applied; that in the act of turning spicules or edges of bones may wound the maternal parts; and that brain-matter escapes into the cavity of the uterus.

The *Crotchet* and the *Vertebral hook* (fig. 325) are useful if there is no better instrument with which to extract after perforation, and if the head comes easily. There is always, in the case of the former, the danger of its slipping and wounding the mother. In using the crotchet it is necessary, after passing it along the guiding fingers of the left hand to a hold on the upper aspect of the base of the skull—usually the sella turcica, or some place in the middle fossa (if the vault has been removed), or the under surface of the chin—to exercise counter-pressure by the fingers of the left hand, so as to grasp the part included between them and the crotchet.

Fig. 325.—Oldham's vertebral hook.

Comparison of the Methods of Extraction after Perforation.—The best methods consist, no doubt, in the use of the cephalotribe or the craniotomy forceps. The others have drawbacks which have been mentioned. On the whole the cephalotribe is under nearly all circumstances the most satisfactory instrument for the following reasons. The hold obtained, if the instrument is properly adjusted in the method described, is a perfect one, and there can be no slipping. It was formerly said that the head expanded in the opposite diameter to that in which it was compressed, and that in consequence there was a bulging into the conjugate, where as a rule there is the least space. This is only true to a very unimportant degree, for the head compensates for its compression mostly by elongation in the axis of the blades, and not transversely to this. Even if there were some bulging from the blades of the cephalotribe, any objection on that account could hold good only in the case of a generally contracted pelvis with a very small transverse diameter; for the instrument and the head can be rotated so as to place an expanded diameter in the transverse diameter of the pelvis. Extraction by the cephalotribe is possible through a conjugate of two inches under favourable circumstances, since the blades close to about 1½ inch. It is an easier instrument to apply than the craniotomy forceps, whether the latter is used

as a tractor or a cranioclast, for it is applied to the whole head, while the latter has to be adjusted in a more detailed manner, one blade being inside, and the other outside the skull. There is also no danger from projecting spicules of bone, which in extraction after cranioclasm is a possibility to be feared.

On the other hand, it may be said, in favour of the craniotomy forceps used as a tractor, that the head is made to elongate, and be thus considerably attenuated by them; and that in a generally contracted pelvis, or in a generally contracted and flat pelvis, a little space might be thus gained.

It is probable that there is not much to choose between the two instruments if they are used with equal skill; but as the average practitioner does not see a large enough number of cases to become very skilled in the use of both, it is best to know the capabilities of one instrument, and use it on all occasions.

Cranioclasm must now be very rarely necessary, but delivery has been performed through a brim with a conjugate of 1¼ inch if the measurements of the pelvis given can be relied on (Elizabeth Sherwood's case, described by Osborn).

Such a case would never in these days be considered suitable for cranioclasm, for the head would not enter the brim, and could not therefore become impacted; and the deformity would be discovered before it was too late to do Cæsarian section, which would be the operation for this case. If the child were dead, in the case of a conjugate about this size, it would still be safer for the woman to have Cæsarian section done, owing to the danger she would run from the amount of manipulation necessary; and it would be infinitely better in its after-results, for the woman would be sterilised at the operation, and would not run the risk of a recurrence of pregnancy and the same danger.

It has been recommended *to do version before craniotomy*[1] in all cases where it is possible. It is urged in favour of this method that the head can be fixed by pulling on the legs, which are carried out of the way in front of the mother's pubes; and the base of the skull can be easily broken up by the perforator, entering through the floor of the mouth, and cutting through the basi-sphenoid, the head being thus made more compressible. There is, however, the danger of the preliminary version to be considered; and further, experience has not shown that there is any great difficulty in extracting the head coming first. The suggestion, at all events, removes the idea that there is any difficulty in perforating and extracting the after-coming head. It is perhaps unnecessary to say that preliminary version would not be good practice in a case of hydrocephalus where perforation was necessary.

Mortality.—Where perforation and extraction by the cephalotribe are performed under favourable circumstances, that is, when the woman is not exhausted by unavailing exertions, and has not been damaged by mistaken attempts to deliver by the forceps, the maternal mortality should be nil. *Per se*, the operation is absolutely safe, since if it is done aseptically and skilfully there is no possible way in which harm can accrue.

[1] Donald, *Obst. Trans.* vol. xxxi.

Decapitation

Indications for the Operation.—Decapitation of the child is required in two sets of cases; (1) certain conditions arising in transverse lies, and (2) certain cases of locked twins.

1. *Transverse Lies.*—The ordinary way of delivering cases of this abnormality is that of version. When, however, the uterus has become tetanically contracted round the child or dangerously over-retracted owing to prolonged labour after escape of the waters, and it is dangerous to the integrity of the uterus to attempt to turn, the wedge formed must be broken up by decapitation before the woman can be delivered (p. 473). Also, if the child is dead, and there is the least risk to the mother in attempting version, decapitation should be done.

2. In the case of *locked twins* immoveably fixed in a certain position with regard to one another and to the pelvis, decapitation is the only way out of the difficulty (p. 476).

The instrument most commonly used is what is known as the sharp hook, or decapitator, or Ramsbotham's hook. A strong pair of scissors is sometimes used; but the hook is no doubt safer in most hands, since when it has been once adjusted ready for cutting, the risk of wounding the maternal parts is much more easily avoided. The hook, besides, only needs one introduction, while the scissors may want several, and the former also cuts through the neck much more quickly.

It is of advantage to have the cutting edge of the hook serrated, for it then works through the tissues more rapidly than if the edge is a merely sharp one.

Mode of Performance.—In the case of transverse lie (see p. 473), the presenting arm is to be drawn down, and if not already prolapsed it is to be brought through the cervix into the vagina as far as possible, so that the hand lies well outside the vulva. The neck is thus brought within reach of the fingers of the left hand, which are to be introduced as a guide. The hook is passed up flat along the fingers until its upper end has reached the neck. It is then insinuated between the finger-tips and the neck, and gently turned—its blunt end doing no harm if reasonable care is taken—so as to lie across the upper side of the neck with its cutting edge at right angles to the neck, and drawn firmly down against the skin. The point of the hook is then found by the forefinger on the opposite side to the one on which it has been passed, and the handle is swayed from side to side through a small arc. The direction of cutting is to be kept at right angles to the neck, or the hook is liable to cut deeply into the opposite shoulder to the side of entrance, and thus not to sever the head. The finger, never leaving the point, prevents the hook from freeing itself with a jerk at the end. It is an advantage to have the child's arm steadily pulled upon during the operation.

When the head is separated, the body can be easily drawn out by the arm, the head slipping upwards and to one side.

After delivery of the body the head may be extracted by expression, when a minute or two has been given to the uterus to contract and retract down on its diminished contents; or the head may be seized by the craniotomy

forceps in any diameter. Or the forceps may be used ; or the cephalotribe. If the craniotomy forceps is used it may or may not be necessary to perforate first ; and in any case it is useful to have the head fixed by external pressure.

Evisceration

Indications for the Operation.—In cases where the pelvis is too small to allow the body to pass after delivery of the head by the cephalotribe or by cranioclasm ; or if for the same reason the body will not pass in the case of a podalic lie ; or if the body is too large, either from general large size of the child, or in the case of a monster or in such diseases as general dropsy, ascites, or hydrothorax, it is necessary to remove the contents of the abdomen or thorax as far as possible. This can be done by opening these cavities with a perforator or a pair of large scissors. The trunk can then be seized by the cephalotribe and extracted ; and if the head is aftercoming it may be necessary to reduce the size of this too.

Spondylotomy

By this is meant division of the spinal column at any point of its length, in the same kind of conditions of transverse lie as those which need decapitation. It is most easily done with the scissors, or a sharp hook may be got over the trunk at the easiest spot. It is, however, much better to decapitate, for the head alone is much easier to deliver than the head with the neck and some part of the trunk attached to it.

CHAPTER LII

Cæsarian Section, Treatment of Ruptured Uterus, and Porro's Operation

Cæsarian Section

This is a very ancient operation, the first performance on the account of which any reliance can be put having taken place in A.D. 1610 by Trautmann, in Wittenberg, in the case of a woman with a hernia of the uterus. Children may have been extracted from the body of the dead mother by cutting open the womb before this, and probably were, but stories of this operation previous to the date mentioned are entirely mythical. The origin of the name is no doubt, as Plinius, quoted by Spiegelberg, suggests, derived from the child being born 'a cæso matris utero.'

Definition.—The operation consists in reaching the uterus through an abdominal incision, opening the uterus, and extracting the child. The wounds are then carefully sutured.

Its object is (1) to deliver a woman, of whom the natural passage is too small to allow of the passage of the child at term by that path, even after embryotomy (see p. 440) ; or (2) to deliver a woman at term who wishes for a living child, on whom induction of premature labour at the proper time has not for some reason been practised, and in whom the pelvis is too small to allow a living child at term to pass ; or (3) to obtain a living child from the body of a mother who has just died undelivered.

Scope of Operation.—The indications in group (1) may be considered as absolute—that is, that Cæsarian section is the safest for the mother. Also, the child is born alive instead of dead. The alternative operation is some form of embryotomy.

The indications in group (2) are relative (see p. 441). The operation is here an alternative to embryotomy, but embryotomy which can be done without danger to the mother, the child being the only sufferer. Or in the case of a woman who wishes for a living child, the proper date for induction of premature labour may have been allowed to pass by accident, or by carelessness on the part of the mother, who had been already warned of the condition of affairs.

The disadvantage of the operation is the danger to the mother, which varies according to the woman's surroundings, her state of health at the moment, and the skill of the operator.

The advantages are that a full-time strong child is born ; and that the woman can be sterilised by dealing in some way or another with the ovaries or tubes at the time of operation, which will prevent recurrence of the danger. If the mother is the subject of malacosteon, the removal of her ovaries will cure the disease as well (p. 449) ; and if the obstruction to labour is due to a large fibroid, it will bring about atrophy of the tumour.

In group (3) the operation must be done not later than about twenty or twenty-five minutes after the death of the mother, or it is of no use, for the child is found to remain not longer than this in a recoverable state when the mother's death has been sudden. It is useless where the mother's death has been of a kind to slowly starve the child of oxygen while she is sinking.

The measurements of the pelvis which render this operation necessary or desirable are discussed in the chapters on Contracted Pelvis, and in those dealing with obstruction from tumours.

Instruments required.—These are merely the instruments required in any abdominal section—namely, scalpels ; blunt-pointed scissors of large and small size ; a dozen pressure forceps of two sizes ; a dozen small round, and two large flat, sponges (natural or artificial) ; dressings ; and a many-tailed abdominal bandage (or any other kind preferred by the operator). Eight or ten half-round Hegar's needles, No. 1 or 2 size, and the same number of long straight needles. Silk is the best material for the sutures in both the uterine and the abdominal walls ; but if a separate peritoneal suture is introduced over the uterine wound, as is most commonly done, this had best be of fine catgut. In case it may be necessary or desirable to amputate the uterine body (see Porro's modification below), two feet of india-rubber cord or tubing, or a serre-noeud, must be added. A very large Hodge's

vulcanite pessary, straightened out to lie flat, is useful to control the bleeding while the first incision is being made into the uterine wall. Two assistants, in addition to the anæsthetist, will be required.

Operation. *Time of Operating.*—To within a very recent period it was thought necessary to wait until the labour began before operating, but this has been found by later experience to be unnecessary, and even a disadvantage. The advantages were supposed to be (1) that the uterus, having begun to contract, was the more certain to do so vigorously after the placenta had been extracted, and thus prevent the hæmorrhage which would otherwise occur; and (2) that the os was dilated, so that the lochial discharge could flow away easily.

It is found, however, that the uterus contracts equally well whether labour has already begun or not; and, as regards both this and the drainage of the uterus, the os could be dilated by passing a bougie, and starting labour a few hours before the time fixed for the operation. If the spontaneous beginning of labour is waited for, it may happen in the middle of the night when no one is ready; unless a perpetual vigil, which might have to extend over a number of weeks, is kept. This would, of course, be impossible if the patient were at any distance from a medical centre, and absurd in any case. Such waiting would also prevent the proper preparation of the woman.

The fact that the time of operation can be fixed beforehand as easily as that of any other operation is one, though a minor one, of the reasons of the increased success of Cæsarian section to-day, as compared with the disastrous results of twenty years ago.

Steps of the Operation.—The woman is to be prepared, as for any other abdominal section, by being purged for several days beforehand, kept in bed, and fed lightly. An enema should be given about six hours before the operation.

Fig. 326.—Normal abdomen.

Fig. 327.—Pendulous belly.

The dotted line corresponds to the incision. (After Cameron.)

When placed on the table, the lie and position of the child must be accurately made out, so that there may be no fumbling about when the moment for extracting the child from the uterus has come. The abdomen has been well scrubbed with soap and water the evening before, especial attention being paid to the navel, and a piece consisting of several folds of moist sublimate or cyanide of mercury gauze has been applied and secured during the night over the front of it. The pubes have been shaved. A mackintosh sheet, with a large hole about a foot long and four or five inches wide, through which the incision into the abdomen will be made, is now arranged on the abdomen so as to protect from wet the other coverings of the patient. The abdominal incision is made as usual in the middle line, and its height on the abdomen

depends on whether the woman has a pendulous belly or not (see figs. 326, 327, after Cameron).

It is to be six inches long, and not nearer than three inches to the pubes, for the uterus will be opened well up towards the fundus, and there will be no pedicle to ligature or pelvic exploration to make as in most other abdominal sections. When the uterus has been exposed, it should be got as nearly central as possible in the abdomen ; it will often be found rotated considerably, and it is very desirable that the uterine incision should be in its middle line. The pessary above-mentioned is to be laid on the uterus about the middle of the abdominal incision, and there firmly pressed down by the first assistant. The bleeding being thus checked within the area of the pessary, the uterine muscle can be deliberately cut through, layer by layer, till the membranes are reached. The more carefully this is done the better, for it is very important that the membranes should not be opened at this stage. When the membranes are reached, they will probably bulge through the opening, which is as yet not more than an inch or so long. If the placenta happens to be in the way (its position may have been determined before by palpation, see p. 346) it will bleed, but the bleeding can be arrested by using a finger of the left hand as a plug. Now, without rupturing the membranes, this finger is to be run along between the membranes and the uterine wall, and used as a director on which to divide the uterine wall for about three inches above and the same distance below the original opening. The best instrument to use for this purpose is a pair of blunt-pointed scissors, but a probe-pointed bistoury is used by some. If the placenta lies in the line of the incision, the finger is passed between it and its amnionic layer, which is on the deeper aspect of it, and it is cut through along with the muscle.

The membranes are now to be ruptured, the hand passed in at once through the rent, so that as little liquor amnii escapes as possible, and a knee or the head (not an arm) seized, and the child at once extracted. Any delay at this stage may involve gripping of the child by the contracting edges of the incision. During this time of extraction the assistant is to keep his hands firmly pressed on the abdominal surface just outside the

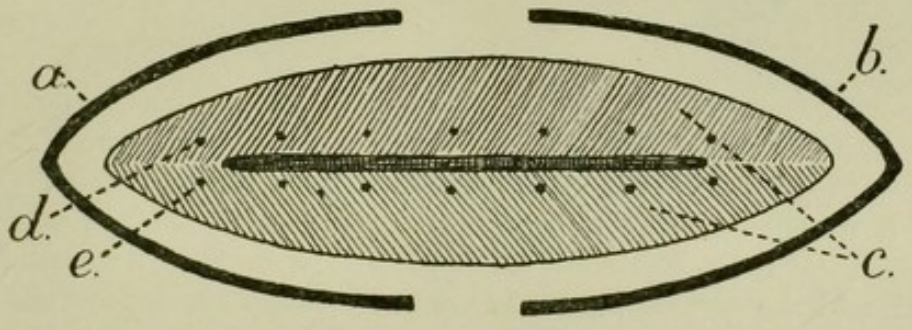

Fig. 328.—Incision, edges grasped by assistant's hands. *a*, right, *b*, left hand ; *c*, cut surface of muscle in one plane ; *d*, *e*, depth to which sutures should reach.

incision, so as to allow of no blood or other fluid getting between the surface of the uterus and the under surface of the abdominal parietes, and into the deeper parts of the abdomen. When the uterine incision is completed, he can hook a finger into each commissure of the uterine wound, and so keep the surfaces in close contact. Directly the child is extracted two clips are to

be put on the cord, and the division made between them. The child is now handed to a third assistant told off for this purpose, who will see to the respiration and warmth.

The hand is now to be passed into the uterus through the incision, and the placenta made out and completely removed with the membranes.

The first assistant passes a large flat sponge behind the uterus, and presses the organ out of the wound, through which it will easily come in its now empty condition. It should be folded in a warm (110° F.) antiseptic cloth, leaving the anterior surface and wound exposed. The assistant now grasps the edges of the uterine wound in an ellipse formed by the forefinger and thumbs of each hand, applied just externally to the edges, and everting them ; by this means all bleeding from the incision is at once controlled. The lips of the wound will by this grasp be forced to lie in one plane (fig. 328).

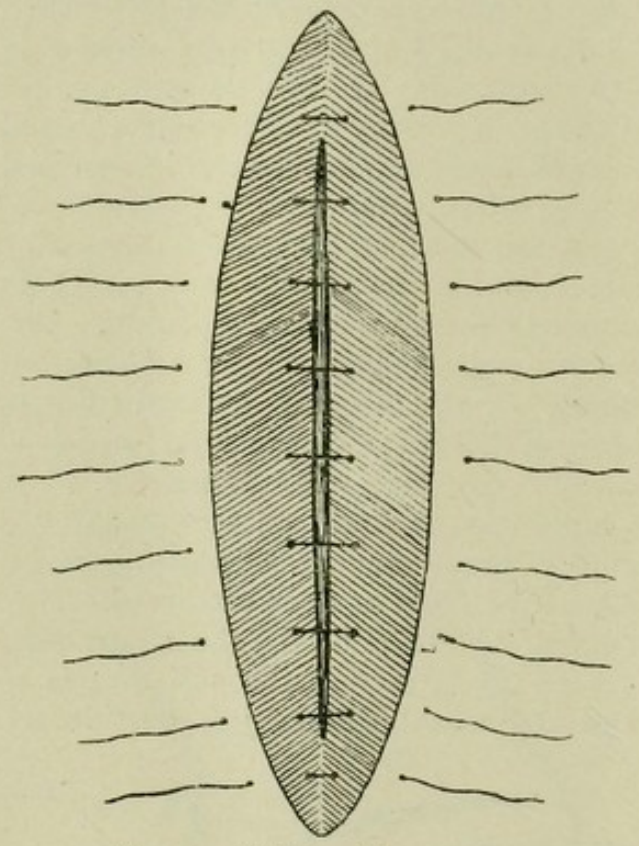

Fig 329.—Position of deep sutures.

The suturing is now to be done. A method which can be rapidly completed, and one which has proved quite satisfactory, is that of the deep and half-deep series (Cameron only puts in one set, the deep one). It is important that in no case should the sutures reach the inner surface of the uterine wall, for they then afford a channel by which the lochia might reach the peritoneal cavity (fig. 329). The sutures are inserted (the deep ones, if two layers are employed) at intervals of half an inch. The half-deep sutures pierce the muscles about an eighth of an inch from the peritoneum, and emerge on the peritoneal surface between the deep ones. The sutures are to be tied after they have all been inserted—the tying of the deep ones to be completed before the half-deep ones are tied—all blood being carefully sponged off the wound as each one is tied ; and the uterus is now to be squeezed gently but firmly in a fresh cloth of the same temperature as before, when it will contract well. If there is still any oozing from the sutures, a fresh cloth must be applied, and the uterus squeezed again. When all is clear the uterus is returned to the abdomen, and if any blood has found its way into the abdominal cavity it must be carefully sponged out, or washed out with boiled water at 110° F.

It is very desirable, however, that before the uterus is returned to the abdomen the woman should be sterilised. This may be done by removing a portion of the Fallopian tube. Champneys found that it was very easy to do this by transfixing the broad ligament just below the middle in length of the tube, tying the tube, and then pinching up a loop of tube, tying this with the

ends of the first ligature, and then cutting off the loop of tube. There is no raw or bleeding edge left by this plan. Simple ligature is not enough, for cases are recorded where this did not prevent subsequent pregnancy.

The abdominal walls are now to be sutured and dressed.

In the above description, the practice of some, who apply an elastic ligature round the lower segment of the uterus before opening it, has not been followed. This method has been found to cause uterine atony by cutting off the blood supply during the subsequent stages. It also involves turning the uterus out of the abdomen, or at least very considerable disturbance of it, before the child is extracted. It is recommended by some that the uterus should be turned out in this way ; it is said that there is less risk of fluids finding their way into the peritoneal cavity if this is done. It, however, is dangerous, inasmuch as it cools the uterus much more than the method described here ; and it necessitates a much longer abdominal incision.

In this operation, apart from the great point of general asepsis, by means of which the present good results have been mainly obtained, the most important matter is the suturing of the uterine wound. If this is not accurately and securely done, there is a risk of the escape of lochia into the abdominal cavity, causing peritonitis ; or of giving way of the wound and free communication between the peritoneal cavity and the interior of the uterus, either event being most probably fatal. Secure stitching was effected in the first operations of the new era by Sanger and Leopold, to whom we owe the revival and establishment of the operation as it is now done by means of separate sutures applied to the peritoneal coat alone. This was carried out in various ways, many of them very tedious. The same result, that of close and accurate coaptation of peritoneal surfaces, can be obtained simply in the way just described, silk sutures being used for the deep layer, and catgut for the peritoneal or half-deep set.

Course of Puerperium and After-treatment.—The lying-in period runs a perfectly natural course if there is no fresh reason to the contrary. It should be mentioned that in several recorded cases the lochia have been very scanty without any further peculiarity being observed. This condition should, therefore, give rise to no anxiety in the absence of septicæmic symptoms. The patient may, with the exception that the abdominal wound has to be attended to, be considered as an ordinary lying-in woman. The dressings of the wound should not be removed before the seventh day or so unless attention is directed to it by some discomfort or rise of temperature. On that day the old dressings may be replaced by a wet piece of cyanide or other gauze : this will soften the dried serum which has collected around the sutures, and will enable them to be removed next day without difficulty. A belt will have to be worn for about a year, as after other abdominal operations.

Abdominal Section and Treatment of Ruptured Uterus

The woman is to be anæsthetised, and her abdomen rendered aseptic. She is placed in the position for abdominal section, either in the ordinary dorsal position, or in the raised pelvis position(p. 493).

The abdomen is opened, and the child and placenta, if not already extracted per vaginam, removed. The abdominal cavity is to be freely douched with water from the tap, if boiled water cannot be procured, at a temperature of about 105° F. Special care is to be taken to cleanse the rent and its neighbourhood, and the stream should be directed through the rent into the vagina for a time, and the tube may also be passed through into the vagina. The uterine edges are now sutured as described in the Cæsarian section, and they are to be as carefully adjusted as in that operation. If the rent is in the back of the uterus, as is most common, it is very difficult and it may be impossible to suture it accurately. In that case, since imperfect suturing is probably worse than none at all, the best plan is to pass a drain consisting of

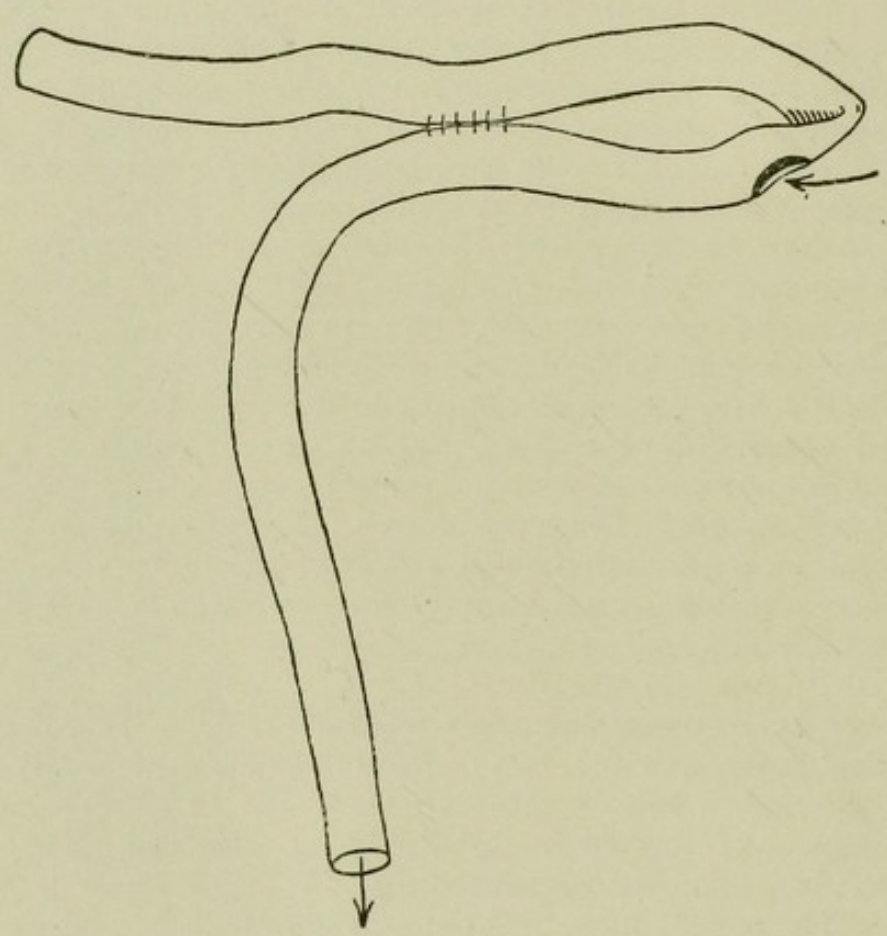

Fig. 330.—Arrangement of drainage-tube.

rubber tubing about as thick as the little finger, or of cyanide or iodoform gauze through the tear into the vagina. If a tube be used it will be necessary to make it self-retaining by using one with a large flange (as in an empyema-tube) and by carefully packing gauze round the end of the tube which lies in the vagina. A self-retaining tube may be extemporised by doubling one end of the tube on itself, and stitching it so, a hole having been made at the outside of the angle (fig. 330).

If gauze is used for the drain, it should be cut into a strip about four inches wide ; and care should be taken that there are no knots or folds in the part that lies above the rent which would interfere with its easy withdrawal per vaginam. Either form of drain may be removed in, as a rule, 48 hours. The question is to be decided by the character of the discharge from

the tube, which may be removed when this is only blood-stained serum. Either tube or gauze is in a few hours completely shut off from the general peritoneal cavity.

The vagina is to be carefully douched twice daily with some harmless antiseptic, boracic acid being probably the best.

Porro's Modification of the Cæsarian Section

The modification consists in the removal of the body of the uterus and the appendages after the child has been extracted in the manner just described. The placenta *in situ* is removed with the uterine body. The stump consists of the cervix and a small portion of the lower uterine segment.

The object of the thus modified operation is (1) to remove an organ which if left would probably endanger the life of the woman. It is recommended therefore in cases of Cæsarian section where from prolonged labour the uterus is exhausted (and possibly already septic), and will not contract so as to prevent bleeding after the placenta has been removed. (Porro's operation is not to be undertaken when in the case of a Cæsarian section the uterus fails at first to contract, for the bleeding can in ordinary cases be practically always arrested by compression in a hot cloth.) The operation is advisable also in (2) cases of malacosteon pelvis, where removal of the ovaries is often curative; for a pedicle which can be safely tied and divided is often very difficult to get when the broad ligaments have been filled up by the lateral expansion that has taken place in the gravid uterus at term. It is also a good operation (3) when from want of experience the operator does not feel certain of being able to manage the complete suturing of the uterus necessary in Cæsarian section of the ordinary kind; or where the materials and other facilities are wanting for that purpose. The instruments necessary for the performance of a Porro's operation are very easily obtainable.

The instruments required are those needed to open the abdomen and the uterus, namely, scalpel, scissors, and pressure-forceps, with needles and silk for sewing up the abdominal wound. The pessary is useful here as before. If, as is safest, the stump is to be fixed in the abdominal wound,[1] in addition to the above instruments, which are to be found in the possession of every practitioner, there are needed a serre-nœud with which to secure the stump, and which will remain on it for about a fortnight; and a couple of long pins which are thrust through the stump to retain it at the skin surface of the abdominal wound. Substitutes for these last instruments can be improvised from a foot of rubber tubing or cord, and a couple of knitting needles.

[1] The intra-peritoneal treatment of the stump by ligature of the ovarian and uterine arteries on each side, and suturing the peritoneum over the cut surface of the cervix and lower uterine segment, is now adopted by some operators. It requires experience in abdominal surgery for its successful application, and the medical man who has not this experience will be wise to adopt the method here described.

Mode of Performance.—Up to the time when the child is removed from the uterus the steps are the same as in a Cæsarian section, except that the abdominal incision should be carried lower (see p. 396). After this stage has been reached the uterus is to be drawn out through the wound, the intestines being kept back with a large sponge or a soft cloth, and the wire of the serre-nœud or the piece of tubing passed round the lower segment as low as possible, including the ovaries and tubes in the part cut off from the circulation. When the wire or tubing is quite tight, it is secured, the wire by the screw, which holds it automatically, the tubing by tying it in a knot, the ends of which may be for the time prevented from slipping by a clip applied over the knot. The body of the uterus is then amputated about one inch above the wire. If there is any bleeding from the stump, the wire or tubing is to be tightened. The pins are now passed through the stump just below the wire, and the peritoneum at the edge of the abdominal wound is sewn to that covering the side of the stump. The pins rest on the abdominal wall, and hold the stump up at that level. They should have some wool packed beneath them to protect the skin. The stump may be powdered with iodoform or aristol, or with equal parts of tannic acid ; and the wound is then dressed in the ordinary way. The stump is to be carefully looked after, being powdered daily as often as necessary, and its wire tightened if there is any oozing. The distal part will slough off about the twelfth day. The proximal part of the stump will then retract as the pins tear through the thin layer of tissue remaining, and it will retreat down into the wound.

CHAPTER LIII

SYMPHYSIOTOMY

Definition.—In this operation the symphysis pubis is divided, so that separation of the two halves of the pelvis to a varying degree is possible. By this means the transverse diameter, and to a limited extent the antero-posterior diameters of the pelvis are increased. The iliac bones hinge on the sacro-iliac synchondroses, on the flexibility of which the amount of space that can be gained depends. In addition to the space acquired by the movement forwards of the ends of the pubic rami, there is a gap produced between the divided ends through which some part of the child's head can bulge slightly. Nature has been known to do a symphysiotomy of a rough kind under the bursting strain caused by a large head being forced through the pelvis, the ligaments of the pubic symphysis being torn through.

This mode of assisting labour is a very old one. It was first advocated by Sigault of Paris in 1768, and soon fell into oblivion. It has been revived by Morisani of Naples within the last few years, and it has been practised with the advantages to be obtained by the use of antiseptics.

Conditions for which the Operation is suggested.—It is of course essential that a living child be obtained by this method, or its object would

be lost, for craniotomy would deliver the woman of a dead child without damaging her. If the child is at term, the pelvis must have a conjugate of at least $2\frac{3}{4}$ inches, since only $\frac{1}{2}$ inch can be gained by symphysiotomy with safety to the synchondroses. If labour is premature a smaller pelvis would still be suitable ; but it would not be justifiable to risk the mother in any way for a premature child, and in such a pelvis if any operation to obtain a living child is to be undertaken, Cæsarian section at term should be unhesitatingly chosen. In a generally contracted pelvis the lowest limit, as given above, would have to be made as high as about $3\frac{1}{2}$ inches. Now a living child *may* be born through a pelvis with a conjugate of $3\frac{1}{8}$ inches, or possibly even 3 inches, if the circumstances are otherwise favourable. So that the *range of the operation* may be considered to lie *between conjugates of* $2\frac{3}{4}$ *inches and* 3 *inches, or perhaps* $3\frac{1}{8}$ *inches* in an otherwise normal pelvis, and both limits will be raised in a generally contracted pelvis.

Narrowing of the outlet, as in a kyphotic pelvis, would also be an indication ; and the operation would act in a more directly favourable manner on the deformity, since widening would occur mainly in the transverse, in which diameter of both the brim and the rest of the pelvis the narrowing is most marked.

Also if from any malpresentation of the head it has become impacted in the pelvis with a conjugate of $3\frac{1}{4}$ inches or more, and cannot be moved by the forceps, the child being alive, the operation might be indicated.

Instruments required.—These are a scalpel, a probe-pointed curved bistoury (unless the special knives contrived for the purpose of dividing the symphysis, Galbiati's or Morisani's, are to be used), sutures of silk or wire, curved Hagedorn's needles, strapping and dressings.

The Operation.—The operation is done during labour, and the os must be almost fully dilated. The woman is to be prepared as completely as possible in the usual manner and anæsthetised. She is then placed in the lithotomy position at the edge of the table or bed, and the legs should be held up, one by each of two assistants. The incision is to be made in the middle line, beginning one to two inches above the top of the symphysis, according to the amount of fat overlying it, and ending just above the clitoris. If it is necessary to go a little lower the cut must run to one side of this organ. The incision is carried down to the joint and the sheath of the rectus muscle. Bleeding vessels are secured ; and then the origin of the pyramidales is separated, and the finger is passed down behind the symphysis. The joint is then cut through from behind forwards with the probe-pointed bistoury. The bones will fly apart, but must be prevented from separating far by the two assistants who are holding the thighs, who will keep them moderately close together. Wide separation of the legs increases considerably the separation of the ends of the pubic bones ; and this is likely to cause much tearing of the soft parts, including the urethra. A few layers of iodoform gauze are now placed on the cut surfaces, and the child is extracted by the forceps. An assistant must take charge of the placental stage. The wound is cleansed, and the ends of the bones pressed together, the thighs being

approximated. Sutures are to be placed in the skin ; and strapping carefully adjusted, and then a firm bandage of some strong material fitted round the pelvis, so as to fix the bones immoveably. The dressings are applied, and the woman should then recover as any ordinary lying-in case.

Results.—The mortality of the operation is stated by Garrigues [1] to have been from 1886 to 1892 inclusive 4·5 per cent. in the hands of experts. Herman makes it about 10 per cent. in all cases of later years. The mortality of the children is said to be about 12 per cent.

The result to the woman as regards the firm union of the divided bones is not so definitely stated ; and though many get well, some remain unable to do hard work or take active exercise on account of incomplete union. The woman is of course liable to become pregnant again, and the operation may have to be repeated an indefinite number of times, unless premature induction of labour is undertaken.

Relation to other Operations.—*Induction.*—This can be done with little or no risk to the mother,[2] and down to three inches conjugate measurement there is a fair chance for the child's survival, since labour will be induced at the thirty-first or thirty-second week at earliest. Labour can be induced down to $2\frac{3}{4}$ inches with a moderate chance of rearing the child. So that induction has a considerable advantage over symphysiotomy, and with pelves of this size, if the cases are seen early enough, the safest course will be to induce labour ; or if it is wished to have a living child, and one certain to be reared in the case of a pelvis below three inches, the woman should go to term, Cæsarian section should then be done, and the woman sterilised.

When labour has begun at term in a pelvis between $2\frac{3}{4}$ inches and $3\frac{1}{8}$ inches, the choice may be based on the question whether the woman is anxious to have a living child, and will undertake the necessary risk of *Cæsarian section* or symphysiotomy ; or is not anxious to do so, and does not care to run any risk for this purpose, when *craniotomy* will of necessity be the operation. The advantages of Cæsarian section have been mentioned ; but it will be contra-indicated if the head has become impacted, since that means nearly always an exhausted uterus. There is, too, the possibility that the child will not be able to be drawn out of the pelvis after the uterus has been opened, either on account of the impaction of the head, or because of its being gripped by the retraction ring. The alternative in this case would be craniotomy or symphysiotomy.

If the possible results of symphysiotomy as regards the life of the child, her own risk, and the possible after-consequences in the matter of the symphysis, and the possible recurrence of pregnancy, are explained to the woman and her relatives, it will be right to accept her and their decision as to the procedure.

The field of symphysiotomy is thus narrowed down to the conditions of a pelvis with a conjugate of between $2\frac{3}{4}$ inches and $3\frac{1}{8}$ inches with the head impacted, when it is the alternative to craniotomy.

[1] *American Journal of Medical Science*, March and April 1893.

[2] 111 inductions have been performed in the General Lying-in Hospital in 6 years, with no maternal death, and with 78 children born alive.

PATHOLOGY OF LABOUR

THIS section is occupied in describing the various kinds of abnormal labour. The abnormality may lie in one or more of the three factors in the process—namely, in the expelling force, the body to be expelled, or the passage through which expulsion is effected (see p. 78).

The term 'Labour' is here, as before, understood to mean labour at or near term.

Before passing on to a description of the examples of abnormality in labour, it may perhaps be expected that a definition of normal labour should be given. This is not so easy as it might appear, and, in fact, is not easier than it is to define health.

If we were to say that the ordinary relations between the mother and child in space and dimensions, combined with an efficiency of the expelling force, constituted normal labour, we should have merely expanded the term, without getting any nearer to a practical definition.

The nearest that can be got seems to be to consider a labour normal when the three stages have each been completely accomplished in some space of time not very far removed from the figures given on p. 407 as the average duration of the respective stages; when labour has been completed without damage to the child, and without more damage general or local to the mother than what is described as the usual amount of laceration on p. 212,[1] and when not more than the usual amount of blood (p. 127) has been lost.

It is impossible to be certain at any stage of labour before the end that a case which has been perfectly natural so far will end naturally; *and it is only after it is finished that any labour can be described as a normal one.*

In addition to freedom from aberrations in the intrinsic factors of labour enumerated above, it is implied in our attempt at a definition of the normal that the other systems of the woman, the circulatory, the respiratory, and the excretory systems, are in such order that they will not interfere with the process of labour. This will be seen to be important when the diseases of the heart, lungs, and kidneys which may affect the course of labour are considered.

[1] It is unnecessary to mention the lie and presentation of the child in such a definition. If the above conditions are fulfilled, it can be assumed with safety that the lie and presentation have been of the best kind, and therefore satisfy the requirements of 'normality.'

CHAPTER LIV

PRECIPITATE AND PROLONGED LABOUR

Precipitate Labour

Definition.—The time occupied in the three stages of labour has been seen to vary, in cases which may be considered normal, within fairly wide limits. It is therefore rather difficult to define accurately what is meant by 'precipitate' labour. It may in a general way be taken to mean that the fœtus is expelled through the maternal passages too rapidly for them to modify themselves by the physiological processes of dilation in such a way as to allow the transit of the child without more than slight lacerations. Or, on the other hand, labour may be too rapid for the fœtus, and especially its head, to adapt itself by moulding to the size of the rigid part of the maternal passage—namely, the bony pelvis.

Labour may also be called precipitate if, in the case of complete dilation of the parturient canal and the easy passage of a small head, delivery takes place much more suddenly than was expected, and finds the woman unprepared; for instance, the child may be suddenly expelled while the woman is at stool or in an upright position; and then it may run considerable risks from falling on to a hard surface, or into fluids in which it is suffocated; or the umbilical cord may be ruptured by the fall.

Causation.—Precipitate labour is due to an altered relation between the expelling force and the resistances; that is, the force is unusually great, or the resistances, either from abnormal size or dilatability of the maternal passages, or from small size or unusual compressibility of the fœtus, are usually slight.

Effects on the Mother.—No harm accrues to the mother except the possible laceration of the parts of the genital tract which normally dilate, unless the uterine pains succeed one another so rapidly, especially in the case of contracted pelvis, that dangerous retraction is quickly produced, and rupture of the uterus results. This, however, is an extremely rare combination of accidents. Emphysema of the neck (see p. 502) is also very rare.

The perinæum is the part which is most liable to suffer, but the vagina may also be lacerated (see p. 494).

Effects on the Fœtus.—The fœtus may be injured owing to the absence of intermission in the pains. The circulation through the placenta is then sufficiently interfered with to cause asphyxia, or the continued pressure on the body of the child itself may damage its nervous centres. By violent pressure of the bony part of the canal on the fœtal head dangerous or fatal

extravasations of blood into the brain or medulla may be produced. Danger to the fœtus by falls or rupture of the cord on sudden expulsion is not very probable. The cord breaks the fall as a rule, and, if in doing this it is ruptured, bleeding does not usually occur from the torn vessels, since they retract. The cord is usually ruptured close to the umbilicus. From this description it will be seen that precipitate labour affects almost exclusively the second stage. Its results as regards the third stage are practically of no importance, for the uterus contracts well as a rule, and the supposed liability to post-partum hæmorrhage is not borne out by facts.

Treatment.—In cases due to diminished resistances there is usually little treatment necessary beyond securing a torn cord, and the rescuing of the child from any dangerous conditions into which it may be precipitated.

Where the pains are too vigorous and frequent, efforts must be directed towards delaying the too rapid advance of the child through the passages. The patient should be placed in the semi-prone or genu-pectoral position, so that gravity may take off some of the pressure on the perinæum ; she should not be allowed any resistance against which she can press her feet, nor any means of fixing the upper part of her body ; she should be instructed to abstain from bearing-down efforts, and to open her glottis and cry out during the pain.

Under these circumstances the administration of chloroform is most effectual, and by it the violence of the pains can be regulated. Some check on the advance of the head may be effected by upward pressure during the pains, and by directing the head, when its escape from the vulva is inevitable, as much as possible forwards under the pubic arch.

Prolonged Labour

Definition.—Any stage of labour may be prolonged beyond its average length. So as to have a standard of comparison, the table showing the average length of the first and second stages may be here repeated.

	First	Second	Total
Multiparæ	8	1–2	10 hours
Primiparæ	16	3–4	20 „
Elderly primiparæ (over 26) .	20	4–5	24 „

Any considerable prolongation of the average time given in this table may be considered abnormal.

Prolonged labour is of two main kinds, and all cases will fall under one or the other heading. In the first group the pains are originally weak, or they fail after a time ; in the second group the pains are normal to start with, but the resistances, whether due to abnormalities of the passage or of the fœtus, are unusually great. In other words, prolonged labour may be due to a weak expelling force, or to increased resistances.

Of these two groups the second is, on the whole, of far greater importance. Cases may be classified : (1) those occurring in the first stage ; (2) those occurring in the second stage ; (3) those occurring in the third stage of labour.

Effects of Prolonged Labour, General and Local.—Prolonged labour, from whatever cause, affects the mother generally and locally. The local effects are exerted on both the contracting part of the uterus and on the genital tract below the retraction-ring—that is, on the parts which dilate.

It may affect the fœtus by direct pressure on the whole or part of its body, and by cutting off the blood-supply to the placenta.

In the First stage. (*a*) Before rupture of membranes. Unless there is some organic rigidity of the cervix which prevents dilation, the pains must have been weak originally. In this case the effects are not marked, and the only result is a varying degree of weariness due to the irritation and disturbance caused by the pain and possibly by loss of sleep. (See p. 411, Inertia Uteri.)

If the cervix is the seat of cancer or is made rigid by cicatrices the uterus may become exhausted or tetanic or over-retracted, and symptoms of obstructed labour may appear at this stage.

(*b*) After premature rupture of membranes.

In this case almost all the liquor amnii runs away after a time ; the uterus contracts on the child, causing the labour to assume the characters of the second stage ; and the symptoms of obstructed labour belonging to that stage make their appearance.

In the Second stage the effects of prolonged labour are most typical. Two classes of case come under this heading ; one where the uterus for some reason becomes *exhausted*, gives up the struggle, and remains quiet and relaxed (see p. 412, Exhaustion of Uterus) ; the other where there is *obstruction* to the advance of the child, and the uterus, striving still against the obstacle, becomes tetanic.

In the former class there are no symptoms beyond those of fatigue ; this is, however, of a more marked degree than that occurring in the first stage.

In the latter class the woman soon reaches a serious condition ; and the lower the head has descended the sooner, owing to the greater reflex action brought about by the pressure on the perinæum.

Constitutional Effects of Obstructed Labour

These are mainly signs of rapidly deepening exhaustion. The expression of the woman's face becomes anxious ; she is restless. The temperature, pulse, and respiration are all somewhat increased. Of these the pulse is the most important indication of danger, and as will be mentioned later, is as a rule to be taken as the sign which shows when assistance is required. Any rise of the pulse above 100, if maintained between the pains, may be taken as an indication that the patient is suffering from prolonged labour ; and the rate under these circumstances may be 120, 130, or more.

The effect on the temperature is at first to raise it by not more than a degree or so ; but if the woman remains unrelieved septic absorption may occur from sloughing of those parts of the genital tract pressed on by the fœtal head, and the temperature may go up to 103° F. or higher.

The rate of respiration is increased proportionately to the pulse. The abdomen becomes tender, the tongue becomes dry and furred, and, later on, brown ; and the patient may vomit. She dies in a 'typhoid' state.

Local Effects of Obstructed Labour

Effects on the contracting parts of the uterus :—

Tetanus Uteri.—In the presence of obstruction the uterine contractions become at first more vigorous, but if the fœtus does not advance the intervals between the pains become shorter and shorter, and the distinction between contraction and relaxation finally becomes lost. If the hand be now laid upon the uterus the organ is found to be not relaxed but hard and firm. The uterus is in a condition of tetanus, and is closely contracted on the child. Owing to the liquor amnii having nearly all escaped the projections of the fœtus cause considerable and unintermitting pressure on those parts of the uterine wall which are in contact with them. This continuous pressure damages the areas pressed upon by arresting the circulation in them.

Tetanus uteri exhausts the patient very rapidly, and demands immediate delivery.

Over-retraction.—In all cases where the contractions intermit, whether labour be natural or obstructed, retraction of the uterus occurs. This process has been described in the chapter dealing with the effects of normal labour on the uterus (p. 97).

Fig. 331.—Much thinned lower segment in a case of contracted brim.

Retraction becomes exaggerated when owing to some cause or another the fœtus is not expelled from the uterus at a rate corresponding more or less closely to the diminution in capacity of the upper or contractile segment. Where such a cause for delay exists the upper segment retracts as usual ; that is to say, its walls become of a thickness corresponding to what would have been attained if the fœtus had been expelled at something like the normal rate. In fact the child is, properly speaking, expelled to the usual extent from this segment, although as regards the birth-canal it may not have made any advance. Consequently the greater part of the ovum now occupies, and distends considerably, the lower uterine segment. Owing to this distension the walls of the lower segment become proportionately thin, and this thinning may reach a very dangerous degree, even to the rupturing point.

Over-retraction is a condition almost peculiar to the second stage of labour ; but under rare circumstances, as, for instance, in the case of an undilatable cicatricial cervix, it may begin during the first stage.

An over-retracted uterus may at any moment become tetanic.

The woman shows the signs of protracted labour as above described in a degree corresponding to the amount of retraction, and of tetanus uteri, if this is present.

On examination of the abdomen, at a height above the pubes depending on the degree of the retraction—that is, from one to four or five inches above the symphysis—a depression is found in the anterior uterine wall, which marks the level of the transition from the thick upper segment to the thin lower segment. This depression is known as Bandl's Ring, and its nature has been already discussed (p. 98). When it is felt, it may be taken as a sign that the uterus has need of assistance; and the higher it lies in the hypogastrium the more urgent is the need.

The effects on the dilating parts of the parturient canal are described on p. 429; the effects on the child on p. 430.

The general results of prolonged labour in the first and in the second stages of labour respectively are then as follows:

In the first stage before the rupture of the membranes there is little or no danger to the mother or child unless there is some organic rigidity of the cervix; and the patient may go on for many hours or even several days without suffering more than slight inconvenience. The amount of disturbance caused depends practically on the nervous constitution of the patient.

After rupture of the membranes and draining away of the liquor amnii constitutional symptoms appear before very long unless the uterus becomes exhausted and relaxed. If the pains still continue, and the obstacle is an insuperable one, it may fall into the condition of tetanus; or, on the other hand, if the uterus continue to act vigorously, it will become over-retracted first, and then rupture (p. 489), or become tetanic.

After the fœtus has passed partly into the cavity of the pelvis, and in a more marked degree if the pelvic floor is being stretched, serious symptoms will arise in an hour or two. These mainly consist in the marked constitutional disturbance just described; and, as will be described later, serious local effects on the vagina and neighbouring organs, and on the fœtus.

CHAPTER LV

ABNORMALITIES IN THE EXPELLING FORCE

In considering the abnormalities of labour in detail the subject will be best divided into (A) abnormalities in the expelling force; (B) abnormalities in the passage; and (C) abnormalities of the fœtus and its appendages.

The accidental complications of labour such as cardiac diseases, eclampsia, post-partum hæmorrhage, laceration of the genital tract form a separate group. After this follow the accidental conditions affecting the life of the fœtus only, and the subject of still-birth.

A. *Abnormalities in the Expelling Force.*—These abnormalities may affect (1) the uterus; (2) the auxiliary muscles of labour.

(1) *Abnormal Uterine Contractions.*—The contractions of the uterus may be abnormal—

(*a*) In force and in frequency.
(*b*) In direction.
(*c*) In character.

(*a*) **Irregularities in Force and Frequency.**—Too vigorous action of the uterus has been already considered as precipitate labour (p. 406).

Insufficient action of the uterus in relation with the resistances. Lingering labour.

Insufficiency may be classified into three groups. The distinction between these is most important. It may be, first, primarily uterine; the uterus is inactive from the beginning, whether the resistances are normal or excessive.

Second, the uterus becomes exhausted before it has completed its work, whether the resistances are normal or excessive.

Third, the uterine contractions are normal; but the resistances are excessive, and lead to changes in the character of uterine action.

The term 'uterine inertia' is applied to the first two of these three groups in the standard works on midwifery; but it is so important to differentiate between them that the term 'inertia' will in this work be applied exclusively to what is called the 'primary' form; and 'exhaustion' to the state at which the uterus arrives during labour, when a condition developes in which no stimulus has any effect.

Inertia Uteri

Causation.—This condition may be brought about by constitutional or by local causes.

Among the former too early pregnancy; or pregnancy in very late life; or general ill-health of the patient, usually from temporary causes, are the commonest. Women who are chronic invalids are very often found to have uteri of quite normal activity.

Local causes include the worn-out uterus of a woman who has had many children; a uterus which is overstretched by its contents—by twins, hydramnios, and concealed accidental hæmorrhage; a full bladder or loaded rectum, which act mainly through the nervous system; and morbid adhesions of the membranes round the internal os. In some cases there is no cause discoverable.

Characters and Results.—The pains are simply weak and occur only at long intervals throughout labour; in fact, the process is a leisurely one. No marked constitutional effects are caused; the woman does not become anxious, but only weary, if the process of labour is very protracted. On placing the hand on the abdomen the uterus can be felt to contract during the pains and to relax completely in the intervals. Although the uterus contracts feebly, there is nearly always some slight advance.

After the child is born the third stage is safely got through.

Treatment.—If the cause is a constitutional one, attention should be directed to improving the patient's condition by the frequent administration of easily digested food in small quantities; and as much rest as possible

should be obtained. The patient, however, should not lie down in bed but recline in a semi-recumbent posture either in a chair or on the bed, so as to enable gravity to act on the uterine contents. Alcohol should not be given except in very minute quantities ; and it appears on the whole better to avoid ergot. If there are local causes for the inertia they should be removed if possible. If, for instance, hydramnios is present in a marked degree, the membranes, after dilatation has been allowed to proceed to a degree which must be determined by the amount of over-distension, may be ruptured. That is to say in extreme degrees of hydramnios, where the uterus appears unable to contract with any effect, the membranes may be punctured early ; but as a rule the more completely dilatation has taken place, although this has occurred very slowly, the better.

In the case of a full bladder or rectum evacuation is the obvious course ; if the membranes adhere round the internal os they should be gently separated by the finger.

In concealed accidental hæmorrhage the membranes will be punctured in the ordinary course of treatment. Friction applied to the surface of the abdomen over the uterus, and compression of that organ during a pain, are most useful and should never be omitted.

In all these cases after the first stage is completed, when the uterus is not stimulated to more active contraction by contact with the fœtus, and no considerable advance is made within two or at the outside three hours, the forceps should be applied to the head ; or traction should be made on the breech by the fingers or a leg brought down to pull on, according to the lie. Traction should be made only during the pains, and the uterus should be stimulated by friction and compression at the same time.

Exhaustion of the Uterus

Causation.—The most usual condition present is some slight obstruction to the advance of the fœtus, which would probably be overcome by a strongly acting uterus, but which is sufficient to tire out a uterus which is not adequate to the work. Exhaustion of the uterus, however, may occur where there is a quite normal parturient passage in a uterus which began labour with inertia.

Characters and Results.—The pains usually begin in a normal manner—although as has just been said there may be primary inertia—and may go on for a variable time ; but at a certain point the uterus gives in and the pains cease.

The woman is tired too ; she may go to sleep. Her strength is renewed after this, and the uterus recovers also ; so that when she awakens the pains return and delivery is probably soon completed.

The great point to remember is that the uterus in the condition just described is exhausted, and cannot be stimulated. It therefore differs on the one hand from the uterus affected with inertia, and on the other from the tetanic uterus which has been described.

The constitutional condition of the patient is simply one of tiredness, and sleep is the only cure for it.

Treatment.—If the patient will sleep without drugs she should be allowed to do so ; if not, it is best to give her ℥xx of tinct. opii, or thirty

grains of chloral hydrate. On no account should delivery be brought about before rest has been obtained. It is useless to give ergot to try to stimulate the uterus, for no result of this kind can possibly be produced. It is most dangerous practice to pull the child out with forceps, for the uterus remains relaxed in spite of being emptied, and post-partum hæmorrhage is almost inevitable.

The following table taken from Herman's work on Difficult Labour shows in a synoptical form the points of difference between uterine exhaustion and tetanus uteri ; which, as he says, present certain superficial resemblances, but between which it is vitally important to distinguish.

Uterine Exhaustion	Tetanus Uteri
(a) General Condition	
Expression placid ; at most showing signs of fatigue ; not anxious. Pulse not over 100.	Expression of face tired and anxious. Pulse small and quick ; generally 120 or over.
Breathing not hurried.	Breathing hurried in proportion to pulse.
(b) Abdominal Examination	
Uterus not tender.	Uterus tender if the condition has lasted long.
Outline and limbs of child can be distinctly felt, and child moved about.	Outline of child cannot be felt, but only that of the hard and immovable uterus ; limbs of child cannot be felt.
(c) Vaginal Examination	
Presenting part can be pushed up easily.	Presenting part cannot be pushed up.
Caput succedaneum small, so that sutures can be felt.	If head in pelvic cavity, great caput succedaneum, so that sutures cannot be felt.
Little or no swelling of vagina and vulva.	If head in cavity, vagina and vulva swollen.
Remember also the contrast in treatment.	
Give the patient sleep ; do not deliver her.	Deliver without delay.

He adds : 'In tonic contraction of the uterus ergot ought never to be given ; because its effect is to cause this condition and increase it when present.'

The cases where the uterine contractions are normal but the resistances are excessive will be treated of under 'Abnormalities in the Passage,' and 'Abnormalities of the Fœtus and its Appendages.'

(*b*) **In Direction of the Force.**—This class includes forward displacement of the uterus, found in the condition of 'Pendulous Belly' (see p. 272); lateral displacements; and backward displacements with reference to the brim, all of which occur mostly in connection with contracted pelvis. A description of each will be found under its proper heading.

Bulging of the anterior and posterior walls of lower uterine segment (see p. 454) are included also.

(*c*) **In Character.**—Under this heading the rare condition known as Premature Retraction is found. It was first described in England by Matthews Duncan.[1] It seems to be a condition of retraction without a corresponding amount of contraction. The contractions are described as being spasmodic in character. The result of this abnormality is that the separation of the uterus into a thickened upper and a thinned lower segment takes place so rapidly that the normal expulsive action of the uterus is almost entirely abolished. The ring of Bandl is felt quite early in labour and soon rises to somewhere near the umbilicus.

After delivery of the child the placenta comes away naturally, or is easily expressed, and post-partum hæmorrhage does not occur. It is described as occurring mostly in young primiparæ of nervous temperament.

Treatment.—Delivery is to be assisted by forceps, or by traction on the breech.

Irregular contractions of the uterus have also been described. According to Herman such inequalities of action in the uterine walls are due either to the normally greater vascularity of the uterine wall at the placental site; or where, in obstructed labour, the liquor amnii has been all expelled, and the child is closely embraced by the uterus. At the parts where the circumference of the child is small there appears to be a stricture; in other words, at this part contraction seems to be greater than it is elsewhere. Such a constriction may be produced also in obstructed labour by imperfect dilatation of the internal os; or more commonly by the retraction ring.

(2). *Abnormal Auxiliary Forces.*—This practically means insufficient action of the abdominal muscles.

The abdominal muscles may become exhausted by being used in the first stage of labour; they may be the overstretched muscles of Pendulous Belly; or they may act at a disadvantage in cases of considerable diastema of the recti; they may be rheumatic; the woman may refrain from using them in bearing-down efforts because she dreads the pain; or they may be paralysed to a varying degree in cases of paraplegia.

The physiology of the auxiliary muscles of labour, and the stages of labour in which their assistance is necessary, have been fully described. If they fail in their action the effects may not be marked, for in cases of paraplegia the uterus has been found to be equal to the task of expelling the fœtus unaided. Their absence would probably be most felt in the third stage of labour; but if the presentation is one of the breech the expulsion of the after-coming head would most likely be impossible without artificial assistance.

[1] *Obst. Trans.* vol. v.

CHAPTER LVI

B. ABNORMALITIES IN THE PASSAGE

1. Abnormal Pelvis

General Remarks.—The pelvis should offer no obstacle to the passage of a child of the average size in one of the normal lies (see p. 128). If it does, it is deformed in some way. Deformity thus means smallness in one or several of the pelvic diameters, and from an obstetric point of view concerns the internal measurements only. External deformities, unless, as they usually are, they are combined with internal ones, are of little or no importance. Deformity in fact is only of importance as it affects the relation of the pelvic measurements to those of the fœtal head. The commonest diameter to be affected, and often the only one, is the conjugate. It is already in a normal pelvis the smallest diameter with which the fœtus comes into relation. It has the thinnest covering of soft parts of any diameter, and on this account also diminutions in its measurements are most important.

The pelvis is deformed if the mechanism of labour is by it caused to deviate from the normal ; and this effect is not necessarily shown by actual obstruction, but also by indirect effects, by causing face-presentations for instance, which alter the course of labour.

The same pelvis may cause at one labour no trouble at all, and may cause the woman's death at a subsequent one. There are in fact many points besides actual measurements to be considered, and these will be passed under review in their proper order. In any case the effect of contraction in one diameter depends much on whether other diameters are large enough to compensate for the diminution and to take such diameters of the head as cannot pass the pelvic diameters with which in normal labour they come into relation. For instance, contraction in the conjugate to a small degree is of much greater importance if the pelvis is generally small than in one in which the conjugate is the only diameter affected.

The slighter amounts of contraction are much commoner, and therefore more important than marked contractions. They are more dangerous in many cases because labour can go on to some extent before any suspicion is aroused, and the real state of things may not be discovered until late. Where the contraction is very marked it is nearly always obvious at the beginning, and preparations can be made early.

The frequency of contracted pelvis must vary very much in different countries ; for in Germany, according to Spiegelberg, nearly one pelvis in seven is deformed in some degree. In Great Britain the proportion is nothing like this.

Appearance of the Patient suggesting Pelvic Deformity.—In the case of a primigravida seen before the sixth month or so of pregnancy it is important to be aware of the possibility of the existence of deformity of the pelvis.

In her case there is no history of previous labours to suggest any cause interfering with normal parturition, and there is therefore nothing to suggest any pelvic deformity but her external appearance.

In some cases there is nothing in the patient's figure which suggests the possibility of any abnormality ; but in others it may be noticed at once that the woman is dwarfed in stature, or has an obviously distorted spine ; or that there is absence or mal-development of one leg, or lameness possibly due to hip disease. Or she may be markedly bow-legged, or the shape of her face and head may be those produced by rickets.

When such suggestive appearances are found, external measurement at least of the pelvis is necessary. If the patient has already borne children the history of her previous labours is of the greatest value if it can be obtained from the medical man under whose care she has been.

It will be seen, when the treatment of these deformities has been considered, how important it is to recognise them early in pregnancy. Labour may be induced at an appropriate time, and the woman and child may pass through labour with perfect safety. If, however, the contraction is not discovered until labour is begun and some delay or difficulty only then forces the deformity on the notice of the physician, it may be too late to save the child, and in some cases the mother's life may be sacrificed.

Pelvimetry.—The most important measurement of the pelvis in the large majority of cases is that of the brim ; and of the diameters of the brim, the conjugate. The normal measurements of the pelvis will be found on p. 83. First of all, if possible, it is well to form some idea as to which kind of deformity is most likely to be present in the case under observation. The indications suggesting one or the other kind will be found described later under the several classes.

The patient should lie on a couch in as absolutely straight and flat a position as possible on her back. The instruments required are a pair of callipers, of which Matthews Duncan's pattern is the best, and a tape measure. Various other instruments have been invented for taking internal measurements, but they are unnecessary. With the woman lying on her back the first measurements to be taken are the distance between the spines and the distance between the crests.

The distance between the spines is measured by placing one of the tips of the callipers just external to the tip of each spine in a small pit which can readily be felt outside the origin of the sartorius muscle. This diameter should measure 10 inches.

It is sometimes recommended to place the ends of the callipers on the actual tips of the spinous processes. In this position it is more difficult to keep the ends of the callipers steadily applied to the bone ; and since in most records of cases the measurements given are usually taken outside the spines, it is necessary to mention the fact if the last-named method be employed.

Distance between the Crests.—The points between which this distance is measured are those which lie furthest apart on the crests ; and these points can easily be found by the callipers in a pelvis which is not very much distorted. If, however, there is so much deformity that the widest part of the crest lies, as it sometimes does, between the spines, the points for

measurement of the crests are arbitrarily taken 2½ inches behind the spines. This corresponds to the middle point in length of the crest. The normal relation of the distance between the spines to the inter-cristal measurement is as about 10 to 11. The importance of these measurements in a pelvis suspected of deformity consists in the demonstration of (1) *actual diminution* in one or both measurements, showing that the pelvis is generally small; and of (2) *altered relation* of the two measurements. In the commoner forms of pelvic deformity, many of which are due to early rickets, it is found that the inter-cristal measurement either does not exceed the inter-spinous by one inch, or it is no more than equal to it, or is even less than it. It is much more common to find the inter-cristal measurement diminished when this result is obtained than to find the inter-spinous one increased.

In one form of pelvis which is much rarer, the malacosteon pelvis, the normal relation of spine and crest measurement is exaggerated by diminution of the inter-spinous diameter.

External Conjugate. Diameter of Baudelocque.—This is not a measurement of very great value. The variable amount of fat over the symphysis and the back of the sacrum makes only a rough approximation to the actual measurements of the bony pelvis obtainable. It should measure about 7½ inches. The points between which it is taken have been already described (p. 85).

Diameter across Trochanters.—This measurement again is only a very approximate one, and is in practice frequently omitted.

Distance between Posterior Superior Spines.—This measurement is of value as indicating the width of the base of the sacrum. The width is diminished in pelves where disease of one or both sacro-iliac articulations has interfered with the growth of the lateral masses of the sacrum.

Width between Tubera Ischiorum.—This is obtained by applying the points of the callipers to the middle, as far as can be judged, of the outer edge of the tuberosities; or it may conveniently be taken by tape measure. Diminution in this measurement occurs in the class of pelvis which will be dealt with under the heading of Transversely Contracted Pelvis.

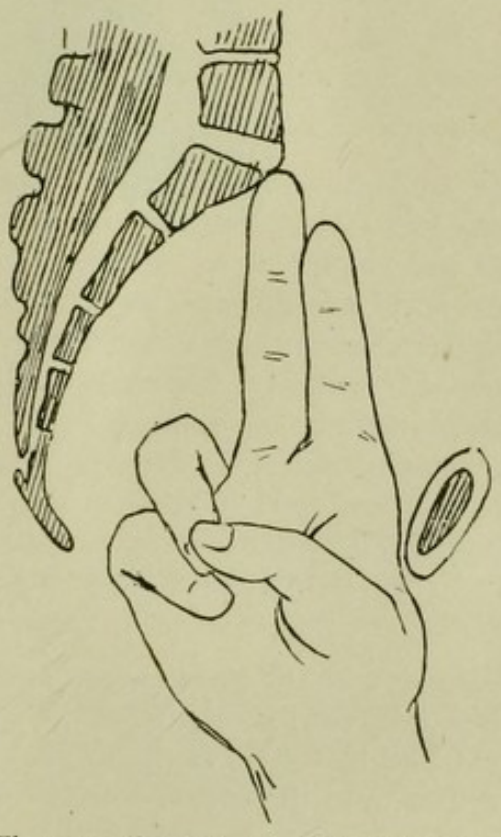

Fig. 332.—Method of measuring the diagonal conjugate in the normal dried pelvis. It is seen from the position of the knuckles of the 3rd and 4th fingers that the finger could not be made to reach the promontory in a normal pelvis if the pelvic floor were present without very great displacement of parts and severe pain.

The above measurements are all external ones, and have the advantage that they can be taken without any vaginal examination.

The internal measurements are two: the diagonal conjugate, from which the true conjugate can be pretty accurately deduced; and the direct measurement of the conjugata vera by the introduction of the whole hand into the

pelvis. This last measurement can as a rule be taken immediately after labour only.

Diagonal Conjugate.—This is the distance between the promontory of the sacrum and the lower edge of the symphysis. It can be taken up to the time before the head descends too low to allow of the promontory being reached.

The patient should lie on her left side with her knees drawn up, and the two first fingers of the right hand passed into the posterior fornix and pushed onwards so as to reach the promontory. The inclination of the brim of the pelvis to the horizon must be remembered, and the fingers will be directed almost in the axis of the trunk. When the promontory is reached, and this can only be effected with difficulty and with much pain in a woman with a normal pelvis (fig. 332), the tip of the second finger is kept in

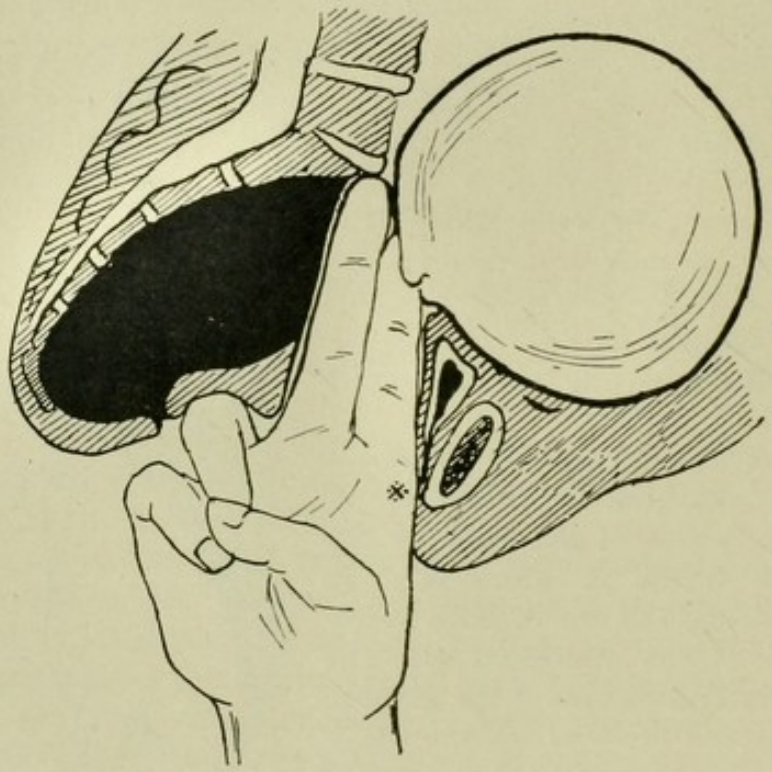

Fig. 333.—Method of measuring the diagonal conjugate in a case with contracted brim. *, point to be marked.

contact with the promontory, and the radial border of the hand is raised so as to be cut by the lower edge of the symphysis (fig. 333). The point thus cut is then marked by the tip of the finger of the other hand. Both hands are then withdrawn, and the distance between the two points measured by callipers.

Care must be taken that a projection forwards of the line of union between the first and second sacral vertebræ is not mistaken for the promontory. This deformity is occasionally found in rickety pelves and is called a 'false promontory.' If the true promontory can be reached by the forefinger alone, it is certain that the antero-posterior diameter of the pelvis is considerably shortened. The object of taking the diagonal conjugate is to obtain a number from which the true conjugate can be deduced. It will be seen in the diagram (fig. 334) that the diagonal conjugate and the true conjugate form two sides of an obtuse-angled triangle, which is completed

by a line representing the depth of the symphysis, AB. Since the obtuse angle at A is a fairly constant angle, the length of PA can be deduced from that of PB. The average amount to be subtracted is $\frac{2}{3}$rds of an inch ; so that supposing that it is found that the diagonal conjugate measures $4\frac{1}{2}$ inches, the true conjugate should then be calculated at something between $3\frac{3}{4}$ and $3\frac{7}{8}$; this is quite near enough for practical purposes.

In cases where the depth of the symphysis is greater than the normal one of $1\frac{1}{2}$ inch (B′), it will be readily seen that more has to be subtracted from the diagonal conjugate to obtain a just estimate of the measurement required. More has to be subtracted also when the symphysis is inclined away from the usual angle (B″), so that its lower edge is further forwards (fig. 334).

In all cases therefore, the depth and inclination of the line AB should be observed where this measurement is being taken.

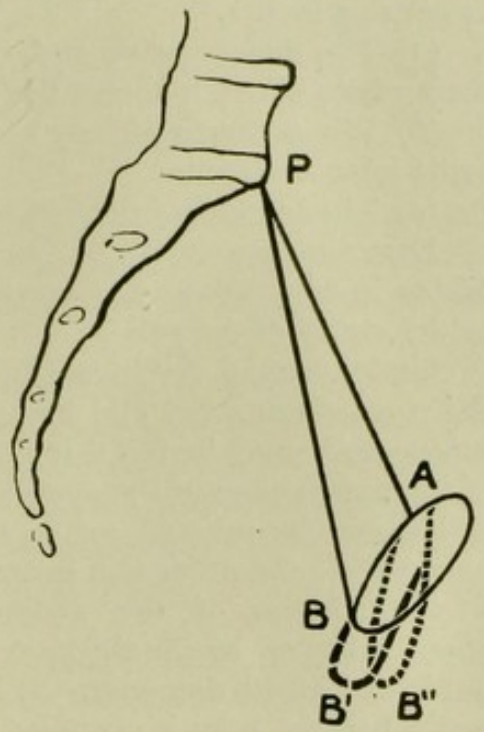

Fig. 334.—*P A*, conjugata vera ; *P B*, conjugata diagonalis ; *B′* and *B″*, other situations of lower edge of symphysis.

Direct Measurement.—This is taken after labour by introducing the whole hand into the vagina. In cases where the pelvis is contracted considerably, it will be found that the figure can be arrived at by passing the extended hand with the thumb apposed gradually up through the brim : the little finger will lie against the promontory, and the radial side of the forefinger or thumb against the symphysis. It is then observed whether the true conjugate will allow the whole width of the four knuckles and thumb to pass through it, or whether the hand is arrested in its upward passage, and if so at what level. Johnson, who wrote in 1769, is quoted in Herman's work.[1] He elaborated a system of measurement which is performed with the hand introduced as above, and held in various positions, the measurements of the hand in these positions being previously known. Those of a man's hand of average size are :

(1) The fingers being bent into the palm and the thumb extended and applied close to the middle joint of the forefinger, the distance between the end of the thumb and the outside of the middle joint of the little finger is 4 inches.

(2) In the above position, the distance from the thumb at the root of the nail, in a straight line with the outside of the middle joint of the little finger, is $3\frac{1}{4}$ inches.

(3) The fingers being in the same position, and the thumb laid obliquely along the joints next the nails of the first two fingers and bent down upon them, the distance between the outside of the middle joint of the forefinger and the outside of that of the little finger is $3\frac{3}{4}$ inches.

[1] *Difficult Labour*, p. 176.

(4) The hand being opened, and the fingers held straight, the whole breadth from the middle joint of the forefinger to the last joint of the little finger is 3 inches.

(5) The fingers being so far bent as to bring their tips to a straight line, their whole breadth across the joint next to the nails is 2½ inches.

(6) When the first three fingers are thus bent, their breadth across the same joint is 2 inches.

(7) The breadth of the first two across the nail of the forefinger is 1¼ inch.

Direct measurement by the whole hand must never be neglected after a labour in which there has been any difficulty that may possibly be ascribed to deformity of the pelvis.

Under special circumstances there are two other methods of arriving at the true conjugate. The first is to depress the abdominal wall so that the promontory may be felt through it, and to measure from this point to the front of the upper edge of the symphysis. This is best done by a tape, one end of which can be pressed on to the promontory by the forefinger of the left hand, while the other end is carried forwards over the top of the symphysis. The thickness of the abdominal wall in front of the promontory is about balanced by the thickness of tissue, including the bone, in front of the pubic end of the diameter. It is impossible to measure the conjugate in this way when the brim is occupied by the uterus, pregnant or recently emptied. A considerable amount of fat in the abdominal wall or rigidity of the abdominal muscles is a bar to its employment. The second way is by measuring the fœtal head after labour. After labour has taken place through a narrow conjugate, the fœtal head is moulded, so as in one diameter which is now measured with callipers to accurately represent the conjugate measurement. If the mechanism of labour has been observed, the diameter through which this measurement should be taken is known ; and if the contraction is considerable the promontory may cause the formation of a groove in the bone of the vault which has been pressed against it.

Value of Pelvimetry in Practice.—Exact figures are unattainable by any of these methods except by that of direct measurement, and, as a matter of fact, if they could be obtained they would be of no conclusive value, since there are so many other factors involved in the passage of the head through the available space. First, the exact size of the head is unknown ; second, the force of the uterine contractions which will be present in any case is unknown ; third, the degree of ossification in the fœtal head is unknown ; so that if the estimated conjugate, or other diameter, does not vary from the actual one by more than ¼ of an inch, it is quite near enough for all practical purposes.

The history of previous labours is a point of the greatest value and of still more value if labour has been induced prematurely, and careful notes of its progress have been kept.

It is important to remember that the head is more ossified in male children than in female, and in later pregnancies than in earlier ones ; and that the woman's strength and that of her uterus are usually found to be diminished after several labours. This subject will be returned to and further considered when the treatment of contracted pelvis by induction is being dealt with.

CHAPTER LVII

DEVELOPMENT OF THE ADULT PELVIS

THE adult pelvis, as described in Chapter X., differs in several important points from the infantile type. A knowledge of the latter type is essential, since most of the deformities to be described arise while the bones are still in process of growth.

In young children the sacrum is comparatively very narrow, and the transverse diameters small ; the sacro-vertebral angle does not form a projection to the extent shown by the promontory in the adult ; the tubera ischiorum are, in proportion to the width of the brim, much closer together ; the inter-spinous measurements are nearly as large as the inter-cristal ; the pelvis, as a whole, is smaller in proportion to the body.

Changes.—During the whole of the child's life an alteration in size and shape is going on, but at the time of puberty the change is most marked.

The alteration is due to (1) the growth of the pelvic bones with the growth of the whole body ; (2) the action of those muscles which are either attached to, or act indirectly upon, the pelvis ; (3) the body-weight transmitted through the pelvis to the femora in standing and walking, or to the tubera in sitting.

Speaking generally, the action of growth is mainly exercised in altering the shape of the sacrum ; which becomes wider by the growth of its alæ. The body-weight and the muscular action tend in another way to further widen the pelvis.

Counteracting the outward thrust of the femora entirely, however, the muscles attaching the lower end of the spinal column to the femora, principally the psoas, produce an inward thrust. In the standing position the inward thrust preponderates ; in sitting, owing to the relaxation of the muscles, the outward thrust of the tubera preponderates.

Sacrum.—It has been said that the effect of growth is mainly exerted on the alæ, and the sacrum is thus widened.

The effect of the body-weight transmitted through the vertebral column is twofold, and consists in (*a*) an alteration in the curves ; and (*b*) an alteration of the position of the sacrum in relation to the axis of the trunk.

The body-weight is found to be transmitted along a line passing vertically through or just in front of the sacral promontory (fig. 335). The sacrum is supported at the sacro-iliac synchondroses, and the line joining the centres of the area of support on these surfaces passes well behind the promontory.

The promontory is therefore forced downwards and forwards towards the centre of the pelvis. The alæ are held back at the sacro-iliac joints, and so

the anterior transverse concavity of the sacrum is diminished. It becomes flatter in the greater part of its extent, and at the promontory becomes even slightly convex (fig. 338).

(*b*) When the promontory of the sacrum falls forwards and downwards under the pressure of the body-weight, the sacrum rotates on a transverse axis (the line joining the centres of the area of support alluded to above) running through somewhere about the centre of the sacro-iliac synchrondrosis, and so the bone tends to move into a horizontal position. The sciatic ligaments, however, with the pyriformis and part of the levator ani and pelvic fascia prevent the lower end from going backwards and upwards (fig. 335), so the ultimate effect of these opposing actions, one at each end of the sacrum, is

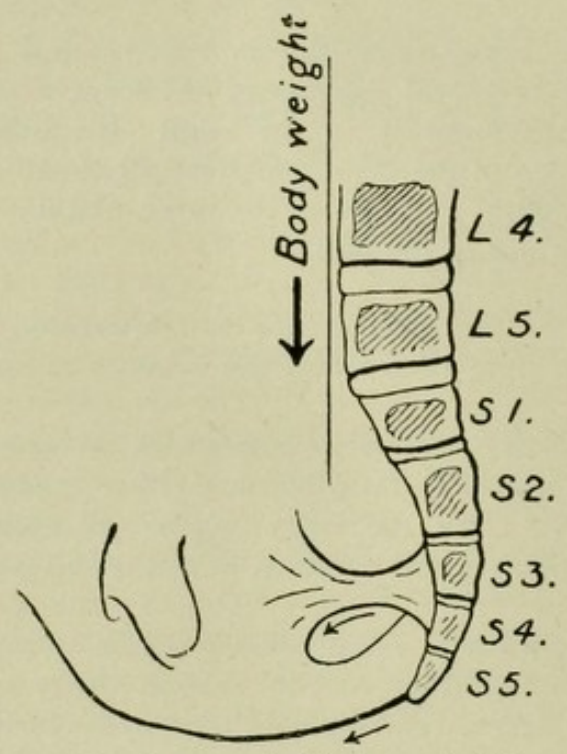

Fig. 335.—Development of pelvis (sacrum). (The vertebræ are numbered.) Body-weight falls along line indicated. The arrows show the pull of the sacro-sciatic ligaments.

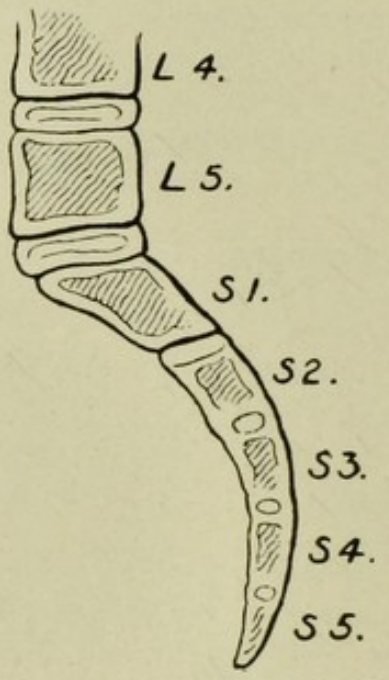

Fig. 336.—Development of pelvis (sacrum). Adult shape.

to bend the sacrum and increase its anterior vertical concavity (fig. 336). The body-weight tends also to make the sacrum sink bodily forward and downwards between the iliac bones (fig. 337).

Innominate Bones.—The sacrum is supported to a very considerable extent by the posterior sacro-iliac ligaments, which suspend it between the posterior ends of the innominate bone. These ligaments, being attached to the innominate bone behind the sacro-iliac synchondrosis, convert each bone into a lever.

In looking at these bones as levers of the first kind it will be seen that the effect of the body-weight acting through the above-named ligaments is to pull the posterior ends of the bones downwards and inwards. The fulcrum is at the sacro-iliac synchondrosis, and the anterior ends of the bones are pulled *outwards and upwards* (fig. 337).

For the bones to move in this way they would have to part company at

the middle line in front ; but this is prevented by the symphysis pubis, so that the only action produced is an increase in the curvature of the lever, and thus of the transverse diameter of the pelvis.

The innominate bones in their turn rest on the heads of the femora in a standing posture. Their resistance to the body-weight is directly upwards. Since the points where the resistance is applied, namely, the acetabula, lie outside a vertical line drawn from the sacro-iliac synchondrosis (fig. 337), their upward pressure would rotate the iliac beam round this joint as a centre, so that the acetabulum should move *upwards and outwards*. The outward component is more than neutralised by the inward pull of the muscles attaching the head of the femur to the pelvis, and the pressure becomes an *upward and inward* one. The most marked instance of the effect of this inward pull is shown in the malacosteon pelvis (p. 449).

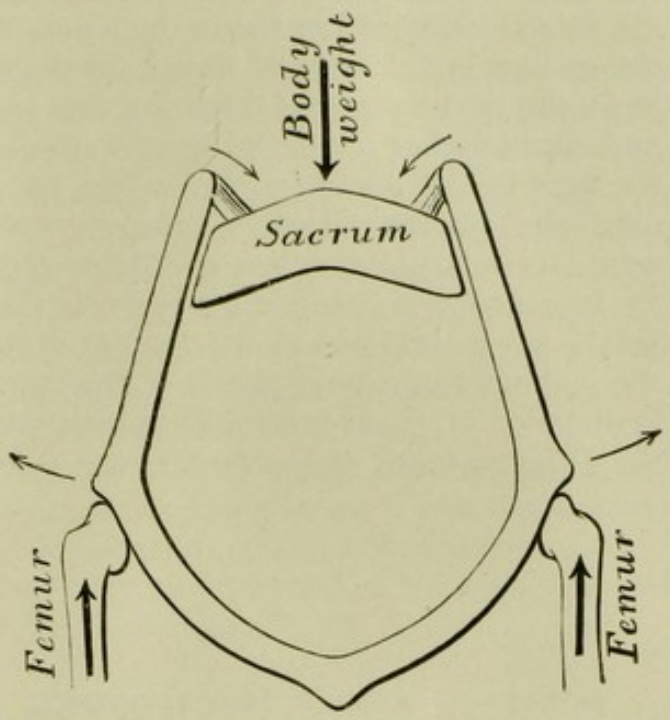

Fig. 337.—Development of pelvis (infantile shape). The arrows represent the direction of the inward pull of the sacrum on the posterior ends of the innominate bones, and its result in tending to widen the pelvis.

When the subject is sitting the upward pressure is transmitted from the tubera. These also lie outside a vertical line dropped from the sacro-iliac

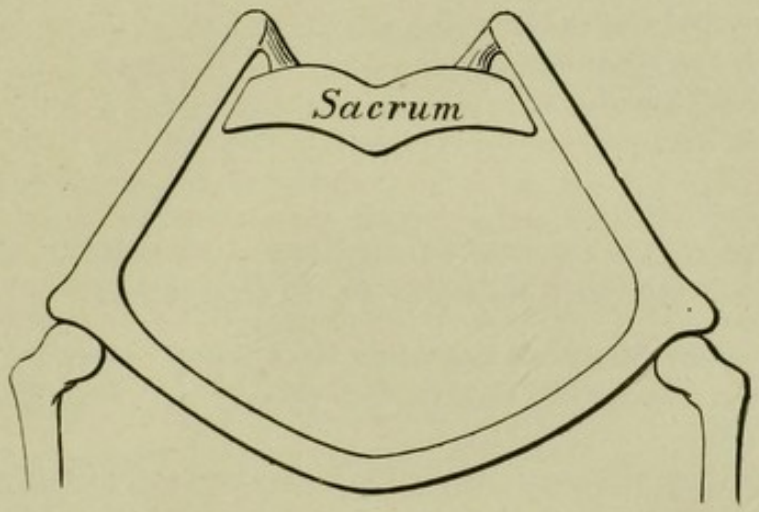

Fig. 338.—Development of pelvis. Adult shape. The transverse diameter and the anterior convexity of the sacrum are exaggerated for the sake of contrast.

joints, and therefore tend to widen the pelvis ; and, since the muscles are relaxed and there is thus no opposing inward pressure, the widening action is well marked. This effect is most marked in the case of pelves belonging to women who have no legs.

Effects of inclination of Pelvis.—The more the brim of the pelvis is inclined to the horizon, that is, the more vertically, in an antero-posterior plane, the sacro-iliac joint lies above the point of application of upward pressure, the greater is the outward thrust, for the line of the application of the force lies more in the plane of the brim, that is, in the line of direct transmission ; and, on the other hand, the greater the angle between the line of upward pressure in the femora and the line joining the acetabulum to the sacro-iliac joint, the less effectual is the outward pressure, since the upward pressure acts in a direction less parallel to the plane of the brim.

In consequence, it is a general rule that the greater the inclination of the pelvis (as in lordosis of the lumbar vertebræ) the wider it is ; and the less the inclination (as in kyphosis of the lumbar vertebræ) the narrower. The application of these rules will be seen when the methods of production of the different kinds of deformities are considered.

CHAPTER LVIII

VARIETIES OF DEFORMED PELVIS

THE only practical way of classifying deformed pelves is to do so by the resulting deformity and not by the pathological causes. We have the following :—

Those with contracted conjugate, in which the pelvis may be small, but is fairly symmetrical.

Those contracted obliquely.

Those contracted transversely.

Those which are crumpled up.

Cases of spondylolisthesis.

Those due to irregular causes, pelvic tumours, &c.

PELVES CONTRACTED IN THE CONJUGATE, GENERALLY CONTRACTED OR NOT GENERALLY CONTRACTED

There are three kinds of pelvis in this group ; and they are named respectively : the Generally Contracted pelvis, the Flat pelvis, and the Generally Contracted Flat pelvis.

The order of their frequency is the Flat, the Generally Contracted Flat, the Generally Contracted.

Flat Pelvis. *Causation and Mode of Production.*—In some cases the diminution in the conjugate is caused by the soft condition of the bones brought about by rickets ; but there are many flat pelves in which there is no sign of this disease having existed. The woman is frequently, though by no means always, small and ill-developed.

The deformity is produced by an exaggeration of the changes, especially

those in the position of the sacrum, just described in the account of the development of the pelvis. The sacrum is forced further downwards and forwards into the pelvis, and thus the promontory comes to lie nearer the pubes. This is possibly due to the body-weight acting excessively in the earlier years of life on the then comparatively soft bones. The sacrum in falling further forwards than normal, widens to an extent varying in its excess the transverse diameter of the brim by pulling on the sacro-iliac ligaments (see fig. 337).

Measurements.—The deformity for all practical purposes affects the brim alone. The conjugate is shortened, but not to more as a rule than to about $3\frac{1}{4}$ or $3\frac{1}{2}$ inches. In a few cases there is slight lengthening of the transverse diameters. The diagonal conjugate is diminished by something near one inch. If this diameter measures less than four inches the pelvis will probably be found to be contracted in other diameters also.

The relation of the inter-spinous and inter-cristal measurements is altered in varying degree. The external conjugate is as a rule somewhat diminished ; but this is not a valuable measurement, as it is always a somewhat variable one. The sacral spines will be observed to be slightly sunk between the posterior ends of the innominate bones.[1]

Generally Contracted Pelvis. *Causation and Mode of Production.*—In most cases the cause is not clear. In two varieties, namely the pelvis belonging to the dwarf, and that form which occurs in cretins, it coexists with other analogous deformities, and is so explained. In the more frequently happening instances there is no deformity in the general figure of the woman, which may be of almost any size or shape.

In the case of the dwarf, the pelvis has a typically female character, but the bones are particularly light and delicate. In cretinoid cases with ill-developed generative organs, the pelvis is rather of the male type, and is often contracted transversely. In the commonest variety where there is no other kind of deformity of the body the pelvis is of the infantile type. The lateral masses of the sacrum are undeveloped, and this bone is more concave transversely and more flat vertically than in the properly developed pelvis.

[1] A rare kind of flattening of the pelvis is found in the case of the so-called *split pelvis*. Here there is no union (symphysis) at the anterior ends of the pubic bones, and their ends are free to part in obedience to the action of the outward lever-action (*see* p. 422) of the innominate bones on the sacrum. When the widening of the pelvis has proceeded to some degree from this cause, the *outward* pressure of the femora is, as will be readily seen, much increased, for their upward pressure takes effect along a line more outside the vertical line from the sacro-iliac synchondrosis than in the normal pelvis. This pelvis occurs as part of the deformity in extroversion of the bladder. If pregnancy ever occurred the separation of the ends of the pubic bones would prevent any difficulty in delivery.

Another rare pelvis is that due to the condition, wrongly named, of *congenital dislocation of the hips*. Here on account of the backward displacement of the heads of the femora, the ilio-femoral ligaments pull the anterior part of the pelvis backwards, the force taking effect in a downward and backward direction, owing to the inclination of the pelvis. This inclination is thereby increased, and as shown on p. 424 this will cause the pelvis to widen. The psoas and iliacus muscles will act in the same direction as the ligaments, and their direct inward pressure and that of the other muscles being diminished by the position of the heads of the femora, the outward thrust of the thigh bones will preponderate. The inward thrust is exerted further back than normal, and merely renders the iliac bones more upright. This pelvis has not been found to cause difficulty in labour.

The promontory is also higher and the sacrum less sunk forwards and downwards; the posterior superior spines are proportionately wider apart; but the relations of spines and crests are not much altered, though the actual measurements are diminished. This deformity appears then to be mainly due to arrested development, without there being any special line of abnormality.

The result is a pelvis diminished in all its diameters, the diminution being most marked in the transverse.

In measuring the diagonal conjugate and then the conjugata vera in such a pelvis when dried it will be noticed that the former is unusually long as compared to the latter. This state of things is due to the unusual height of the promontory, and also in some degree to greater steepness of the symphysis.

The diagnosis of this class of pelvis is difficult, and since there is nothing specially pointing to pelvic contraction to be found in the woman's figure in most cases the condition is not discovered until after labour has become obstructed.

Herman has named this pelvis the 'Small Round' pelvis.

Generally Contracted Flat. *Causation and Mode of Production.*—This form of contraction is practically always due to rickets. In addition to the deformities described in the flat pelvis there is added some distortion due to marked softening of the bones at an early age, and also to the stunting of growth common in these cases.

So that we find the pelvis reduced in all diameters. The sacrum is, owing to the softness of the bones, displaced forwards and downwards as in the flat pelvis, and it has yielded in the centre from the same reason so considerably as to cause the promontory to project forwards and produce the kind of pelvis which, from the outline of its brim, is called the Reniform Pelvis. The slight general concavity of the sacrum on transverse section is changed into a decided convexity, especially at the upper part of the bone; and the vertical concavity is much exaggerated, so that the upper part of the sacrum looks almost downwards.

The relative size of the transverse diameter is increased by exaggeration of the normal widening action already described (p. 422), and the most marked effects in the modification of shape of the several bones will naturally be found at or near their growing surfaces—at the junction of the body and wings of the sacrum, and at the acetabulum where the three divisions of the innominate bone unite.

The outlet of the pelvis is somewhat widened in proportion to the brim. This is due to the action of the body-weight through the tuberosities while the child is sitting. Owing to the weakness caused by rickets a child thus affected probably sits a great part of its time.

The ilia are everted by the action of the glutei, and the relations of the inter-spinous to the inter-cristal measurement is thus considerably changed.

The inclination of the brim to the horizon diminishes in proportion as the promontory is sunk forwards in the pelvis; for on account of the forward position of the line of the body-weight thus produced there is less need of tilting forwards of the pelvis to bring the line of this weight over the femora. There is probably increased inclination to begin with, owing to the exaggera-

tion of the lumbar curve which is common in cases of rickets; but this afterwards corrects itself as the sacrum comes downwards and forwards.

The lumbar and dorsal curves in this disease are as a rule much increased, and there is often more or less lateral curvature of the spine, the promontory being on this account displaced to one side or the other (see p. 444, Skoliotic Pelvis).

Result.—We have thus a pelvis with a conjugata vera shortened to any degree; a small, but relatively to the other measurements large, transverse measurement, and with all the other characters described as belonging to the flat pelvis. It is of very great importance to remember that the contraction of the pelvis affects the whole length of the bony canal, and not the brim alone as in flat pelvis.

Diagnosis.—The points of importance to be noticed are any signs of rickets which may be observed in other parts of the body, and the relations of the spines and crests. The diagonal conjugate gives as a rule a very fair idea of the true conjugate.

The pelvis is usually slightly beaked, owing to the inward pressure of the femora. Sometimes the brim of the pelvis shows an outline something like that of a figure of 8. This rarer form is said to be produced by the action of the recti muscles.

Effects of above forms of Pelvis on Pregnancy, Labour, and Lying-in.—It will be well to consider these effects here, since the forms of pelvis just described are very much commoner than those to be mentioned later, and the modifications caused by them in labour may be taken as fairly typical.

Pregnancy. *Displacement of Uterus.*—The lower end of the fœtus normally occupies the brim, dipping down into it at term to an extent mentioned and figured on p. 129. When the brim is contracted this cannot happen, at all events when the child has attained its full or nearly full development. The incompleteness of occupation of the brim is, of course, the greater the more the conjugate is diminished.

The result of this is that the fœtus, and in consequence the whole uterus, have both to grow at a higher level in the abdominal cavity than is the case when the pelvis is normal. As a result also of the failure of the fœtus to enter the brim the uterus is more easily displaced forwards or laterally. Thus in cases where the abdominal muscles are much relaxed owing to previous pregnancies, and where there is a considerable amount of diastema of the recti, the uterus falls forward partly by its own weight and partly by the pressure downwards and forwards exerted by the diaphragm. In this way the most marked degree of the condition known as Pendulous Belly (p. 271) is produced. The forward displacement is much accentuated if there is any shortening of the lumbar spine from curvature: this is especially the case when there is lordosis, where the form of curvature of the spine adds another cause of forward pressure. Exaggerated lateral deviation is also common owing to the increased mobility of the uterus.

Malpresentations.—These are produced in cases of contracted pelvis by several causes acting simultaneously.

(*a*) The head is not able to enter the brim and rest there. It can thus be turned about readily, and extension in various degrees and lateral movements may easily occur.

(*b*) The exaggerated obliquity of the uterus may, if the back of the fœtus lie to the side towards which the uterus is inclined, cause extension of the head (see Face Presentations, p. 154).

(*c*) The head or the breech, as the case may be, does not fill the brim, since it cannot descend into it, and the hand or cord may slip down in head cases, or the foot or cord in the podalic lie.

The lie of the child is apt to change often during pregnancy.

Incarceration of the Uterus.—If the uterus becomes retroverted during pregnancy, or if, as is more commonly the case, impregnation occurs in an already retroverted uterus (see p. 273), the uterus, instead of being able to restore itself during its growth, is prevented from rising by the fundus being caught under the projecting promontory. This is an effect most characteristic of the flat or generally contracted flat pelvis, and one which the generally contracted pelvis does not produce.

The increased height of the uterus in the abdomen in contracted pelvis must always be remembered in calculating the period of a pregnancy from the position of the uterus.

Labour: First Stage.—The head cannot enter the brim as far as usual, and it cannot therefore get low enough to fill the lower uterine segment, as this is distended and forced down during the first stage.

In consequence the intra-uterine pressure comes with its full force on the bag of membranes; and so this is elongated (as in breech cases from the same reason), dilates the cervix imperfectly, and ruptures early as a rule. (See Results of too Early Rupture of Membranes, p. 114.)

The whole of the liquor amnii then drains away, and the pains become characteristic of the second stage of labour. The os is now not dilated by the still too high head, and so collapses again even if, as rarely happens, it has been already well dilated by the membranes. The pains continuing force the head against the brim, and cause the cervix to be nipped between these two hard surfaces.

Second Stage.—The course of labour now depends on the amount of pelvic contraction, and on the strength of the pains.

(*a*) *If the contraction is moderate, allowing the head to pass after much moulding.*—Supposing the pelvis is contracted in the brim only, and has a conjugate of say 3½ inches; then if the uterus responds to the increased resistance by increased activity the head is forced through the brim, and the trouble is at an end. If, however, the uterus is weak it contracts round the child (tetanus), the mother becomes exhausted, the child dies from pressure, and the uterus is damaged by the long-continued pressure and by local sloughing, and in some cases septicæmia is produced; or exhaustion of the uterus may supervene (see p. 412).

(*b*) *If the contraction is great (from three inches downwards).*—In cases where the pains are strong they become violent, the patient is greatly distressed and makes powerful bearing-down efforts, which at times lead to emphysema of the neck and face from rupture of some of the air-vesicles of

the lung ; the uterus soon becomes excessively retracted and may rupture, or it may contract round the child and become tetanic, and then the effects just described under (*a*) are brought about.

(*c*) *If the pelvis is contracted throughout* the results are the same, but the condition is more certain to become severe since the obstruction does not cease at the brim.

The effects on the maternal tissues in detail are :

(*a*) On the uterus. These have been already described under the heading of Prolonged Labour (p. 409).

On the cervix. This is nipped, as has been just mentioned ; it becomes œdematous from strangulation, and from this cause hæmorrhages into its substance, and sloughing to a greater or less extent may occur.

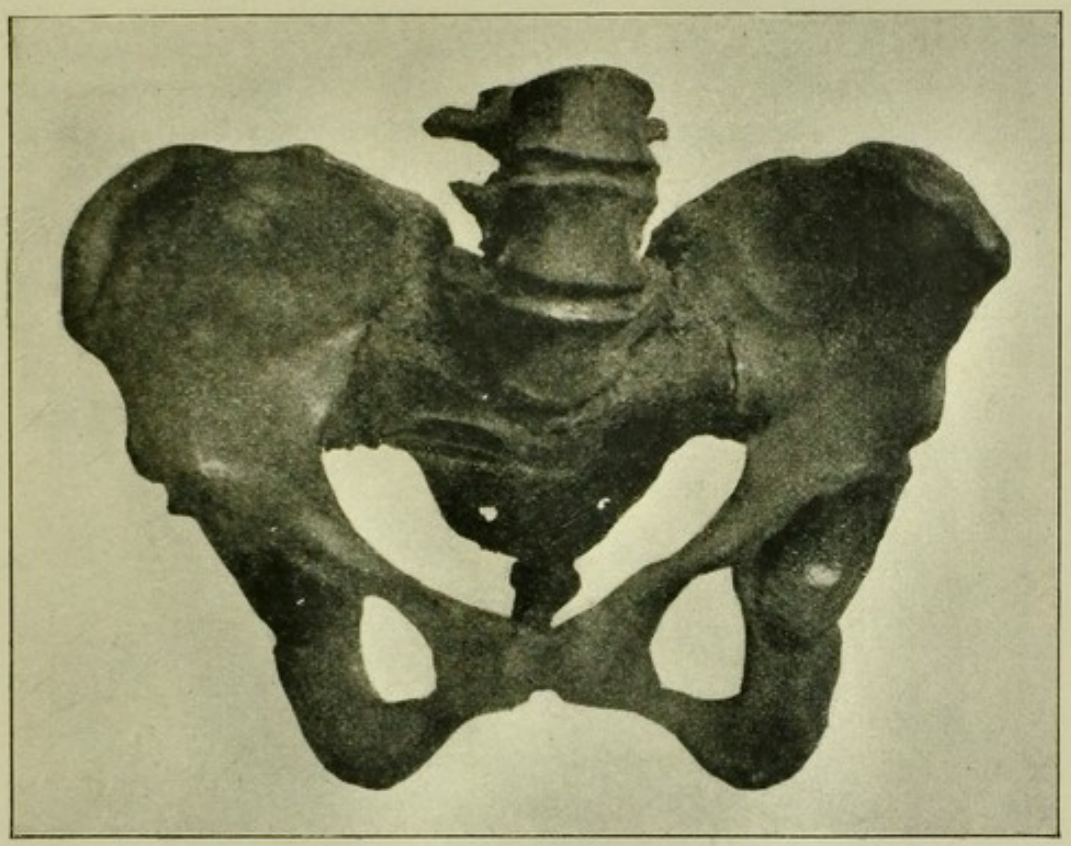

Fig. 339.—Flat generally contracted pelvis, showing the projection of the promontory, which looks to the left. The relative widths of the inter-spinous and inter-cristal measurements are seen. The head was impacted, Cæsarian section was performed. (St. George's Hospital Museum.)

(*b*) On the vagina. This is the most commonly damaged part, for the cervix is usually pulled up out of the way, and leaves the brunt of the prolonged pressure to fall on the former. The same effects are produced as on the cervix. The result of sloughing in both cases is to produce fistulæ, the size of the opening depending on the extent of the tissues killed. These fistulæ practically always open into the bladder (vesico-vaginal, utero-vesical), and not into the rectum. Posterior fistulæ are very rare, since it is quite seldom that the opening occurs into the peritoneal cavity, and this would very soon be closed by the effusion of lymph ; and on the other hand the pressure against the sacrum is never so long continued as that against the back of the pubic

bone, on account of the curve of the parturient canal. Moreover, the concave surface of the sacrum forms a broader surface for the head to press against, and produces less damage than the comparatively sharp edge of the back of the pubic bones. Recto-vaginal fistulæ are extremely uncommon, for the head must be moulded very considerably before it can pass the brim, and therefore passes more rapidly through the lower part of the genital tract.

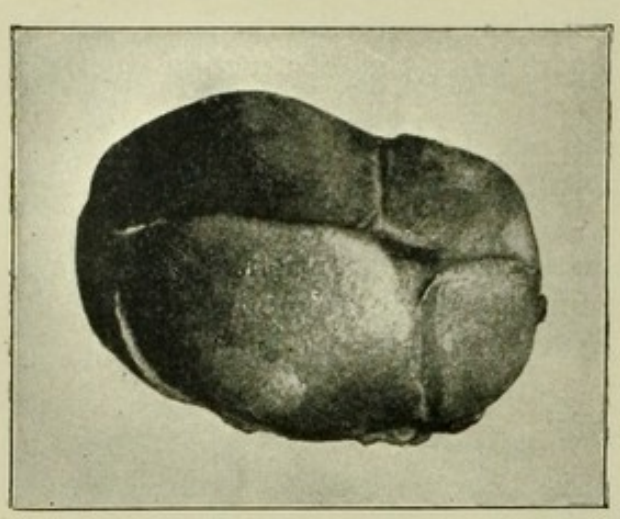

Fig. 340.—Vault of skull moulded by pelvis in last figure. The depression at the left half of the coronal suture corresponds to the promontory. The occiput was to the left.

(*c*) On the child. After the liquor amnii has drained away the intra-uterine pressure is exerted directly on the child and the placenta. It damages the nervous centres of the child if it is long continued, in the end causing death; and it arrests the circulation through the placenta, in this way also leading to a fatal result from asphyxia. The effect on the head is very marked. A very large caput succedaneum is produced in all cases. In flat pelves the

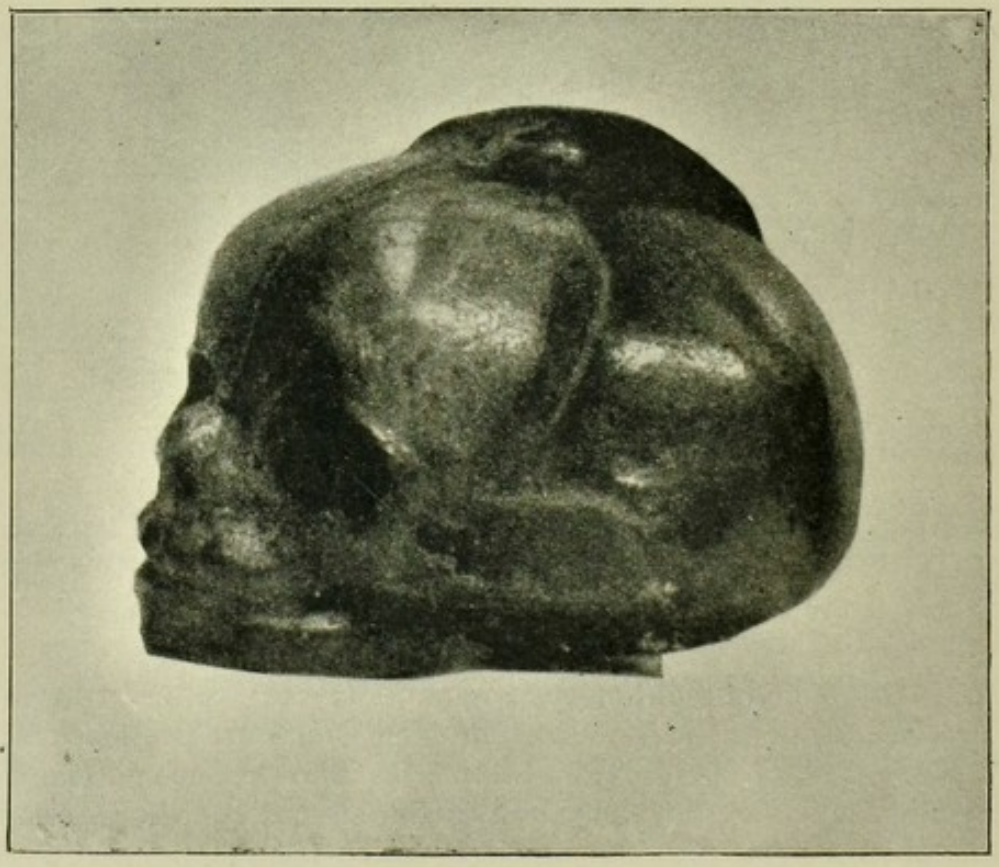

Fig. 341.—Side view of same skull as fig. 340. The great depression of the left side of the skull, and the separation of the edges of bone forming the sagittal suture are seen.

caput is formed at the brim, and in a great degree by the cervical ring. In the other two forms the resistance and pressure are maintained throughout

the passage of the head through the bony pelvis, and the swelling continues to increase until the head reaches the vulva. The great pressure causes bruising of the skin and sometimes local sloughing, the site of this varying in different cases according to the particular mechanism of labour. These injuries are nearly always produced by the pressure of the promontory, which also causes depressions in the bones of the vault of various kinds. These are sometimes grooves which are found to involve those parts of the skull which have successively impinged on the promontory, or they may be more or less circular depressions. Fractures of the bones of the vault and hæmorrhages either beneath the scalp, beneath the periosteum, between the bone and the dura mater, or more rarely into the brain substance, are found. The hæmorrhage into the meninges is usually at the base of the skull, not usually over the hemispheres or into the ventricles. The moulding in all these cases

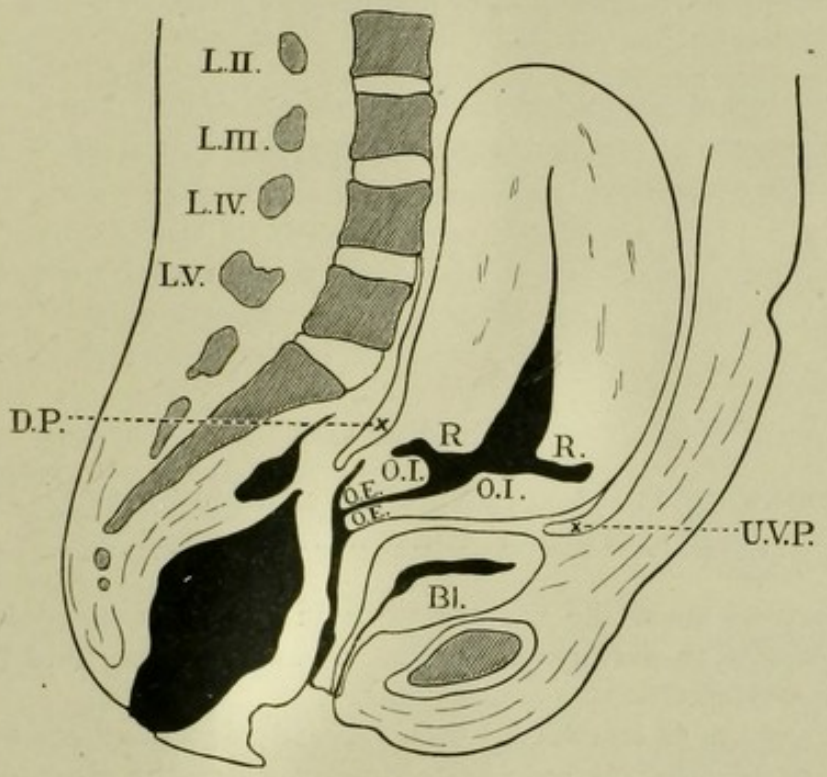

Fig. 342.—Abnormal height of uterus post-partum caused by contracted brim. *D P*, Pouch of Douglas; *R*, retraction ring; *O I*, os internum; *O E*, os externum; *U V P*, utero-vesical pouch; *Bl*, bladder. (From a frozen section by Barbour.) (Compare fig. 141, p. 126.)

is much exaggerated; the parietal bone which is posterior being, if not grooved or dinted, considerably flattened. Considerable moulding causes dangerous over-riding of the sutures (fig. 341), and this may be so great as to lacerate the sinuses, and cause hæmorrhage and death of the child. In head last cases where traction is applied to the base of the skull through the neck the lower bones of the skull may be partially separated from the upper by tearing of the sutures uniting them. Thus the squamous or lambdoid suture may be torn through, or the basilar portion of the occipital may be separated from the squamous portion.

Third Stage.—During and immediately after the third stage of labour the woman runs a certain amount of risk of post-partum hæmorrhage. This is liable to occur, firstly, on account of the exhaustion of the uterus

caused by its efforts to expel the fœtus through unusually resisting passages ; and, secondly, because the uterus after its contents have been expelled does not in cases of considerable contraction of the brim completely fill the pelvis and compress the vessels from which it derives its blood supply (fig. 342), as is the case in the normal pelvis (see p. 213). Another likely cause of hæmorrhage consists in the lacerations of the cervix, which not uncommonly arise during instrumental delivery through an imperfectly dilated os.

Lying-in.—Owing to the damage of the soft parts produced by their compression between the child's head and the bones of the pelvis, and to lacerations, the woman is more exposed to septicæmia than she is after normal labour. In addition to this, manipulations and operations of all kinds necessitated by the obstruction to the course of labour favour the introduction of organisms, both in the air which is admitted under these circumstances, and on the hands and instruments passed into the vagina and uterus.

The production of fistulæ has been already alluded to ; they usually show signs of their presence (leakage of urine) towards the end of the first week, when the sloughs separate.

CHAPTER LIX

MODIFICATIONS OF THE MECHANISM OF LABOUR IN THE COMMONER VARIETIES OF CONTRACTED PELVIS

It is necessary to know the various ways in which nature deals with the difficulties met with in parturition, so that we may then be able to help the woman in the best and most scientific way.

The three groups of contracted pelvis already described are best divided for this purpose into two classes : first, those in which the obstruction occurs at the brim only, Flat Pelvis ; and, second, those in which there is difficulty at the brim, and at other parts of the pelvic canal as well, Generally Contracted Flat, and Generally Contracted pelvis. This division will be found to group in a practical manner certain other differences in the mechanism.

First Class ; Flat Pelvis ; Obstruction at brim only.—The shape of the brim in this class is usually elliptical ; but it is sometimes reniform, especially if the flattening is due to rickets. The modifications found in labour are :

1. A new curve in the path of the head is added to the line which the head follows in passing through the parturient canal. This is due to the projection of the sacral promontory (see p. 425) ; and the curve added has a concavity backwards, which represents the line in which the head moves as it passes in front of the promontory.

2. A transverse position of the head at the brim.

3. Nägele obliquity or asynclitism of the head.

4. A tendency of the whole head to move towards that side of the pelvis towards which the occiput points.

In all these cases after the brim has been passed the mechanism is as usual.

1. *Path of the Head past the Promontory.*—Owing to the encroachment of the promontory on the space at the brim, and the consequent hollowing-out of the sacrum beneath it, the head in entering the brim has to revolve round the promontory, just as it does in normal labour round the pubes.

2. *Transverse Position of the Long Diameters of the Head Ovoid.*—In an elliptic pelvis the occipito-frontal diameter cannot lie in one of the oblique diameters of the pelvis on account of the sacrum being thrown forwards along its whole width, and the oblique diameters being thus diminished. The only available diameter, therefore, is either the transverse diameter or one parallel to it. It is almost always one in front of the transverse diameter on account of the forward position of the sacrum. This transverse, forward position of the head occurs in both elliptic and reniform pelves (see figs. 346 and 347).

3. *Nägele Obliquity. Anterior Parietal Obliquity. Asynclitism.*—This is a want of coincidence of the horizontal planes of the head with the plane of the pelvis occupied at the moment by the greatest transverse diameter of the head. It was supposed by Nägele to occur in normal labour, but this has been shown not to be the case (see p. 135).

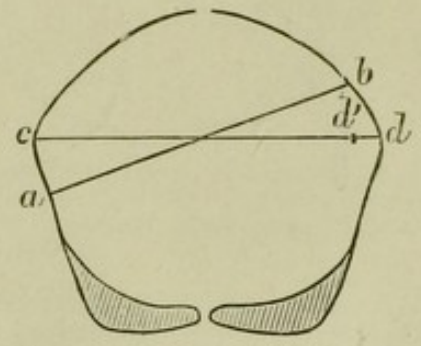

Fig. 343.—*c d*, bi-parietal diameter; *a b*, super-parietal–sub-parietal diameter; *c d'* = *a b*; *d' d* is the length gained.

It does happen in flat pelves, and is the easiest way for the bi-parietal diameter to pass the brim. Its mechanical advantage is as follows: Supposing that the conjugate measures $3\frac{1}{2}$ inches, the bi-parietal diameter ($3\frac{3}{4}$ inches), or even one slightly anterior to this, could not pass with its plane coinciding with that of the brim (synclitic). If, however, one parietal bone descends before the other, a super-parietal sub-parietal (*a b*) diameter engages. This is slightly shorter than the bi-parietal (*c d*), and the head slips through in this way like a stud through a button-hole. The mechanical advantage thus obtained is the cause for the assumption of this attitude of the head, and it would necessarily come about after a longer or shorter time spent in attempts at forcing the head through the brim with the plane of the head coinciding with that of the brim. Its production is favoured from the beginning of labour by two circumstances. First, the uterine axis in these cases is somewhat behind that of the pelvic brim. The uterus is in other words inclined backwards, and exactly the same process occurs as the one which in cases of lateral obliquity of the uterus brings about face-presentations, or increased flexion, according to the relative positions of the back or front of the fœtus and the side to which the womb is inclined (see p. 154). The front side of the head is pushed down first, and the head passes the brim with the anterior parietal bone in advance of the other, and so the head is flexed towards the posterior shoulder (fig. 344).

Second, in cases of pendulous belly, common in contracted pelvis, although the inclination of the uterus is anterior instead of posterior to that of the axis of the brim, yet the head eventually finds itself in an attitude of Nägele obliquity. For in the beginning the head lies with its anterior parietal bone most deeply engaged in the brim, and as the head descends it passes the brim in this way, the sagittal suture lying much nearer to the sacrum than to the pubes (fig. 345).

The projection of the promontory is said to have much share in causing this obliquity. If the pelvic brim is looked at from above or below, there is no doubt a projection of this part over the brim together with a forward position of all the lower lumbar vertebræ; but if it is seen sideways (as in fig. 342) the promontory does not project in front of the line of the lumbar vertebræ, and there is no reason why the side of the head should catch on it.

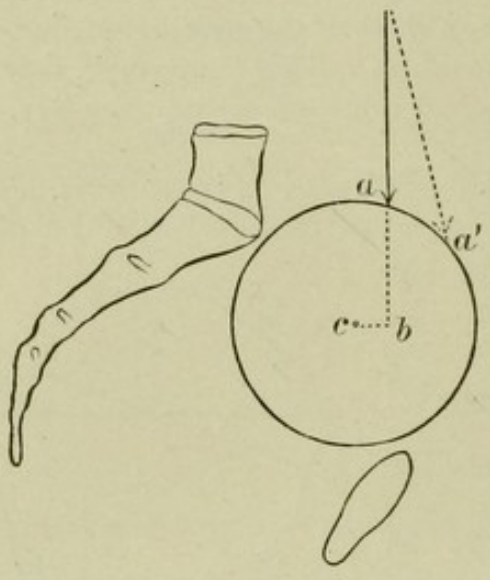

Fig. 344.—*a*, pressure transmitted through condyles rotates head round centre *c*, in virtue of lever *c b*, so that *a* tends to move towards *a'*. The further *a* moves in this direction the greater rotating power the force *a* has.

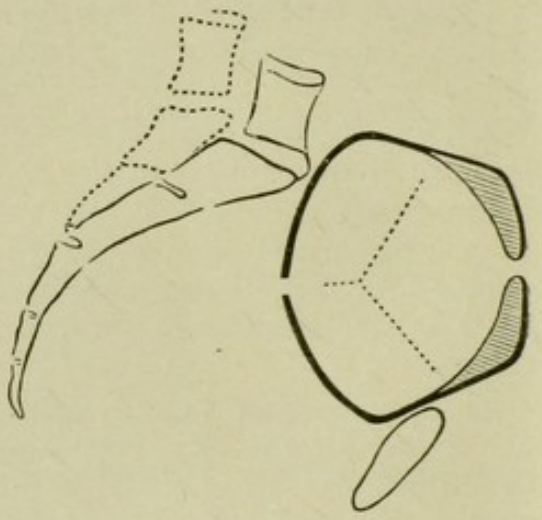

Fig. 345.—Relation of head to brim in pendulous belly.

Nägele's obliquity is often described as an approximation of the head towards the posterior shoulder of the child, but this is wrong. Its practical aspect consists in the relation of the child's head, not to its shoulders, but to the plane of the brim; and it may exist with or without lateriflexion of the fœtal head, as in the case just mentioned of pendulous belly. The result of the obliquity is to bring the sagittal suture nearer to the promontory than to the pubes.

4. *Horizontal Movement of Head in the Direction of the Back of the Child.*—This movement is caused by the shape of the upper surface of the child's head. The bi-parietal diameter is greater than the bi-temporal. The upper surface of the head thus forms a blunt wedge, which is broadest behind, and when this wedge is forced into the space bounded by the symphysis in front and by the promontory behind, it tends to move horizontally in the direction of the base of the wedge—that is, in the direction in which the occiput points, and it brings the smaller diameters of the front of the vault into the narrowest part of the brim, namely, the conjugate. This

horizontal movement is not marked in an elliptic pelvis, since the conjugate is not much narrower than other antero-posterior diameters of the brim ; it is most extensive in the reniform brim, and is limited by the space available for movement in the transverse diameter.

Passage of the Brim.—When the head has arrived at its limit of horizontal movement, it passes the brim in one of two ways—by increased flexion, or by extension.

In the case of the elliptic pelvis, the bi-parietal diameter is gripped at each pole by the anterior and posterior boundaries of the brim respectively (fig. 346). Since the bi-parietal diameter is nearer to the occiput than to the forehead, it happens that when the intra-uterine pressure is applied to the base of the skull, the occipital end of the head is held back and the frontal descends, and so the head is extended. Face and brow presentations are thus produced.

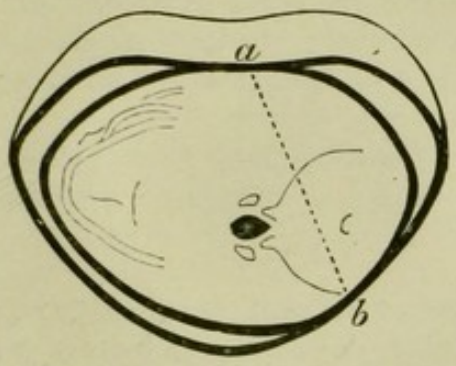

Fig. 346.—Elliptic brim. Extension of head. *a b*, diameter caught by the pelvis.

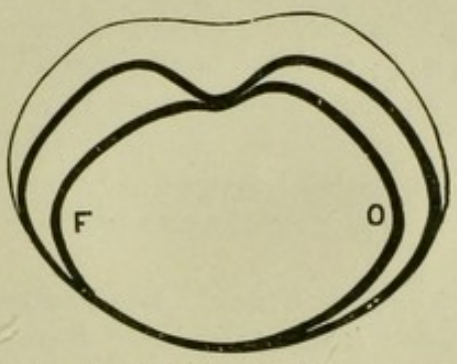

Fig. 347.—Reniform brim. Flexion of head. *F*, forehead ; *O*, occiput. Diameter caught by pelvis lies nearer frontal than occipital end of head.

If, on the other hand, the brim has a reniform shape, the part gripped is somewhere about the bi-temporal diameter, which is caught between the projecting promontory and the back of the symphysis (fig. 347). The front part of the head is now held back, and the occiput descends, producing exaggerated flexion.

After the passage of the brim, which may be effected in favourable cases with a conjugate as low as 3½ inches, the mechanism is as usual. If the extension produced as just described is moderate, the head flexes in the cavity, and the only trouble likely to occur is in the case of occipito-posterior positions, where in consequence of insufficient flexion the occiput may be rotated into the hollow of the sacrum, and may remain unreduced, as has already been described in Normal Labour. (See Unreduced Occipito-Posterior Positions.) If extension is marked, the case goes on as a face-presentation, or in very rare instances as a brow-presentation.

Aftercoming Head.—In breech cases the same delay occurs at the brim when the head is engaging as in head-first cases, and the same horizontal movement takes place. The important difference in the mechanism is that the head enters the brim by the base of the skull, which is the narrower end of the wedge in a vertical section of the skull (see fig. 104, p. 92). This gives a great advantage as regards ease of passage, for there is considerably less friction owing to the angle at which the sides of the skull meet the pelvic walls ; and there is probably no need of Nägele obliquity by the time the

head has descended sufficiently to bring its widest diameter, the bi-parietal, into relation with the brim.

When the bi-parietal diameter is gripped in the elliptic pelvis the head will flex, for the frontal pole will descend ; when the bi-parietal diameter is gripped in a reniform pelvis, the head will become extended. The results of this gripping, as well as the fœtus, are thus inverted.

At this stage the uterus has retracted down so as to only contain the head and the placenta, and therefore acts at a diminished advantage, comparing it with what happens in head-first cases ; and assistance will be required in the passage of the brim.

Posterior Parietal Obliquity.—In very rare cases the posterior parietal bone presents at the brim, and brings the sagittal suture nearer to the pubes than to the promontory. This may be due to the axis of the uterus being behind that of the brim, and the posterior parietal bone descending and becoming engaged in the brim. The line of force acts here in the same manner as it does in the case of pendulous belly, and not as shown in fig. 344 ; and the head, instead of revolving as it usually does, so as to bring the anterior bone lowest, gets fixed in the brim just as it lies.

In face cases the head is found to lie in the transverse diameter of the pelvis just as happens in vertex presentations, and a similar horizontal movement of the head takes place.

Second Class. Generally Contracted Flat and Generally Contracted (Small Round) Pelves. Obstruction throughout Pelvic Part of Canal.—The transverse position of the head at the brim, Nägele obliquity, and the horizontal movement of the head in the direction of the child's back, occur to some degree in any case where the conjugate is contracted in proportion to the transverse diameter.

The more the pelvis approaches to the justo-minor shape, the more does labour resemble what occurs in a normal pelvis with an unusually large head. The points in the mechanism of labour characteristic of these pelves are :

1. Flexion occurs to the greatest possible degree.
2. If the occiput is posterior to begin with it remains so.
3. Moulding of the head is very considerable, and a very large caput succedaneum is formed.

These further peculiarities of mechanism are mainly due to diminution of the transverse diameters throughout.

(1) *Increase in Flexion.*—If the transverse diameter at the brim is less than $4\frac{1}{2}$ inches the occipito-frontal diameter will not pass ; the head then flexes in a marked degree so as to bring the sub-occipito-frontal diameter into engagement. If flexion does not soon happen, or if the transverse diameter of the brim is less than four inches, the head is arrested at the brim. The posterior fontanelle is thus found very low on examination early in labour. In some cases where the brim approaches an elliptic shape, and the bi-parietal diameter is caught, the head will be extended just as happens in flat pelvis.

(2) *Persistence of Occipito-posterior Position.*—The occiput, if posterior to start with, cannot rotate round to the front when it reaches the pelvic

floor, for the transverse diameters of the lower part of the pelvis in which rotation forwards has to occur are too small to allow the sub-occipito-frontal diameter to occupy them ; the long axis of the head engaged has therefore to follow the screw shape of the pelvis, and cannot be influenced by the slopes of the pelvic floor. This mechanism is comparable to that which obtains in the case of an imperfectly flexed head when the occiput is posterior in a normal pelvis (see p. 145). If in the kind of pelvis under consideration the occiput happens to be anterior to start with, it rotates forwards before the vertex reaches the pelvic floor, rotation being caused by the screw shape of the pelvis ; and as the head recedes after a pain it can be felt to rotate back again.

(3) *The exaggerated moulding* is due to the length of time the head is compressed by the walls of the pelvic canal ; and the unusual size of the caput is caused in the same way.

Aftercoming Head.—In this lie the head may engage more easily ; but after engagement the prognosis is extremely unfavourable, since the delay in extraction will certainly cause the child's death.

Diagnosis during Labour of Contraction, and of the kind of Contraction.

The methods of making this during or before pregnancy have been already described.

It is often necessary, however, to ascertain the fact of contraction after labour has begun. The points to be noticed then fall under the following headings :

(*a*) General appearance of the woman (as before).

(*b*) The course of labour on this particular occasion.

(*c*) The history of previous labours if any have occurred.

We need here consider only the points under (*b*).

If the head is impacted or arrested when the patient is first seen, and there is no mal-presentation such as a brow or an unreduced mento-posterior position, and the uterus is acting well, the pelvic diameters must be somehow diminished, or the child must be too large. In this case the pelvis should be measured, and the appropriate treatment at once proceeded with. Fibroids (p. 455) and pelvic tumours must be excluded.

If the case is seen early in labour before the head is engaged, and in all probability attention will have been directed to the nature of the case because the head does not engage, the points to note are the general condition of the woman as bearing on the question of good expulsive power ; the condition of the uterus (tetanus, inertia) ; the effect of pains if any are present ; whether the head, if it is presenting, can be pressed into the brim ; the size of the child ; the position and attitude of the head on vaginal examination, that is, whether the posterior fontanelle is specially low or not : whether the long diameter is transverse ; and the external, and as far as possible the internal, measurements of the pelvis.

CHAPTER LX

TREATMENT OF THE COMMON FORMS OF CONTRACTED PELVIS

THE treatment of contracted pelvis may be considered as it occurs in (1) cases where the woman is seen, and the condition recognised early in pregnancy ; (2) cases which are first seen when the woman is in labour.

Class 1.—Under these circumstances if the pelvis is still sufficiently large for a child capable of being reared (viable)[1] to be born through it, labour must be brought on prematurely.

If the pelvis is too small to allow of the passage of a viable child, the alternatives are (a) the induction of abortion ; and (b) removal through the abdomen by opening the body of the uterus (Cæsarian section) at full time.

Class 2.—Here the line of treatment to be adopted depends on a number of circumstances ; the amount of contraction, the kind of contraction, the general condition of the woman at the time, the presentation, the stage of labour, the condition of the uterus, whether the membranes are ruptured, or not, and if ruptured, whether recently or some time previous, and lastly, whether the child is alive or dead.

The following may be considered to be important data, and on them, speaking in a general way, the line of conduct is decided.

It is possible for a living child at term to be born through a pelvis with a conjugate of $3\frac{1}{4}$ inches ; or even 3, if the circumstances are favourable.

Such favourable circumstances are : that the woman and her uterus are in a healthy condition ; the child is lying dorso-anterior, especially in vertex cases ; the head is not larger or more ossified than usual ; that the uterus is in the normal axis ; and that the pelvis is not contracted in any other diameter than the conjugate.

A child at term, after its head has been artificially reduced by craniotomy, can be extracted through a pelvis with a conjugata vera of anything over two inches (see Craniotomy, p. 386).

A child at term cannot pass through a pelvis if the conjugata vera is not more than two inches, even after craniotomy, without very considerable danger to the mother.

The details of treatment in the two classes defined above are now to be considered.

[1] On inducing labour before term is reached a living child can be born, and it is possible to rear this if the date of pregnancy is not less than the twenty-eighth or twenty-ninth week.

The later the induction can be left the more chance there is of rearing the child. Cases in which the head can be got through the pelvis with a moderate amount of help by the forceps may be considered to have had labour induced at the best possible moment. (See p. 362, Induction of Premature Labour.)

Class 1. The Woman is seen early in Pregnancy.—The pelvis may be large enough to allow a viable child, premature or otherwise, to pass ; or it may be not large enough.

A child born at the earliest viable age (the 28th or 29th week) can pass through a pelvis with a conjugate of $2\frac{3}{4}$ inches to 3 inches. Therefore this measurement is the smallest which will admit a woman into the first group, that is, *which gives her a chance of having a viable child.*

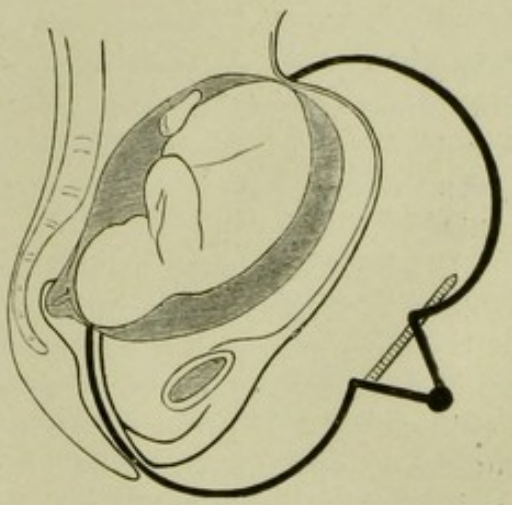

Fig. 348.—Measurement of fœtus in utero by callipers.

The treatment proper for such a case is the Induction of Premature Labour.

Where the patient is a primipara there is no guide from the history of previous labours—the most important evidence of all—as regards the date at which induction should be practised ; for all that can be made out in addition to the size of the pelvis is an approximate estimation of the size of the child. The size of the child should be made out by abdominal palpation, bi-manual examination, and if convenient, by the use of the callipers as described on p. 66 in every case ; and the dates the woman gives of her last menstruation should not be implicitly accepted.

In primiparæ, then, the only guide will be certain approximate dates fixed by taking the average relations of the head and the pelvis at such dates.

The measurements of the conjugata vera which indicate induction of labour at an appropriate week are given in the following table :—

C.V.	Week
$2\frac{3}{4}$ in.	29th–31st
3 in.	32nd
$3\frac{1}{4}$ in.	34th
$3\frac{1}{2}$ in.	36th

After measuring the pelvis and deciding on the date at which labour is to be induced, the physician should tell the patient that she must be seen about a fortnight before this date. He can then make another examination to see if it is not possible for the pregnancy to go on a little longer. The patient should be again measured at that time, and especial notice taken of the size of the fœtal head, and whether it can be pressed into the brim from above. If it is found to enter the brim readily the patient may be allowed to go on for a fortnight longer, when she should be again seen and the size of the head tested as before. The induction must be put off to the most favourable moment for the child, consistent with the safety of the mother. If, however, when the woman is examined the head is found to be larger than would be expected at that period of pregnancy, and if it cannot be pressed into the brim, labour must be induced without delay (see Induction of Labour, p. 362).

It must be remembered that the measurement of the conjugate alone, even if it could be accurately determined, does not absolutely fix the date for induction ; but that other measurements of the pelvis have to be considered, and if, for instance, the pelvis is a generally contracted one, the dates above given must be anticipated in proportion to the reduction of the transverse and other diameters.

If a woman has had children previously the history of her labour or labours is of the greatest assistance. The labour may have been at term ; and if an account of what assistance had to be given, and what the result was to the child, can be obtained from the medical man who attended her, it gives valuable data from which the amount of the obstruction can be estimated.

If labour has been artificially induced in former pregnancies the patient's history is of more value still, for after considering the result of the induction at the date at which it was performed, the most favourable time for that operation in the present pregnancy can be very closely determined. In settling this date it must be remembered (1) that the age of the woman has increased, and that the child's head may be on that account more completely ossified than it was at the same date in the former pregnancy ; and (2) that male children's heads are as a rule more ossified than those of females.

To take an example. A woman gives a history of having had three children as follows : The first six years ago at term ; craniotomy. In the second, four years ago, induced at the thirtieth week, an easy labour, child, a male, not reared. The third, labour induced at the thirty-sixth week, a female, child born dead after prolonged forceps traction. On measuring her pelvis the diagonal conjugate is found to be $3\frac{3}{4}$ in., and the true conjugate is estimated at a little under $3\frac{1}{4}$ in., the rest of the measurements being found fairly normal. The best time for induction will be about the thirty-third week, and the woman should be examined again at the thirtieth, and the date then finally decided upon.

In the second group, *where the pelvis will not at any date allow a viable child to pass*, that is, a pelvis with a conjugate less than $2\frac{3}{4}$ inches, there are two courses open. Abortion may be induced at once, supposing that the woman is seen in the early months of pregnancy or at any time up to the seventh month ; or the woman may be allowed to go to term, and then a Cæsarian section may be done. There is a third course, which may have to be adopted when the conjugate measures not less than 2 inches, and will thus allow the mento-glabellar diameter to pass, and the case is not seen till nearly full time, namely, to perform craniotomy.

Abortion.—When abortion is induced the affair is ended at once, and if this is done aseptically there is usually no danger. But the patient may at once become pregnant again, and abortion might in this way have to be frequently induced. On one occasion or another it is possible that some accident may happen as a result of this procedure ; further, the woman never has a child.

Craniotomy.—If the woman is not seen until the end of pregnancy, or if the case has been designedly left so long so that she may choose between this operation and Cæsarian section, craniotomy will have to be considered, under the limitations above given (conjugate not less than 2 inches).

Craniotomy above this measurement, unless there is considerable contraction of the pelvis in other diameters, is an easy and a safe operation ; and involution and the lying-in take place normally. But there is a small risk each time the operation has to be repeated, though this cannot happen so often as when abortion is induced ; and again, the woman never becomes a mother.

Cæsarian section.—Although this is a dangerous operation its mortality in skilled hands is now small, namely, about 5 per cent. By the operation a fully developed healthy child can be obtained ; and, a further advantage, the woman can be sterilised at the same time. In the hands of one unskilled in abdominal surgery the operation would of course be a very risky one, and it would be wise to perform Porro's operation in preference.

Among these three methods of dealing with the case the choice must be finally left in the hands of the woman and her friends, all the facts and possibilities of each operation being put before them. If the pregnancy goes to term, and the pelvis has a conjugate of over 2 inches, she must choose between craniotomy and Cæsarian section. At this time if the conjugate measures less than 2 inches, Cæsarian section is the safer operation of the two for the mother ; if over 2 inches craniotomy is as a rule safer. In case the conjugate measures less than 2 inches and the patient is seen early in pregnancy, abortion must be induced at once, or the patient must decide to have a living child born at term by Cæsarian section. (For methods of induction of abortion, craniotomy, and Cæsarian section, see chapters on Obstetric Operations, p. 352.)

Class 2.* The case is first seen when Labour has begun.—The first thing to do when it is judged that labour is obstructed by contraction of the pelvis is to ascertain the existence of contraction, and then to make out its kind and degree.

The cases may be divided here into two groups—(*A*) those in which the conjugate measures 3½ inches or more, and no other diameter in any plane is more than slightly involved. (*B*) where the conjugate is less than 3½ inches ; or it measures 3½ inches, but other diameters of the pelvis are diminished.

(*A*) Through such a pelvis as this it is possible for a full-term child to pass, alive and viable. The points to observe in the conduct of labour in these circumstances are—

1. *The membranes must be kept intact as long as possible.*—It is important to obtain complete dilation if this can be accomplished, for the head may not come down at once to occupy the cervix, and the os may then contract again to some extent, and cause obstruction to labour.

2. *Any deviation of the uterus from the normal axis must be corrected.*—Displacements of the axis of the uterus are common in contracted pelvis, and lead to malpresentations ; and in addition to this, obliquities of the uterus cause much loss of force.

3. *The character of the pains* must be carefully watched. If the uterus is found to be getting exhausted (the so-called 'secondary inertia,' see p. 412), the woman must be allowed to rest, and opium or chloral should be given. If the inertia is primary ('inertia,' p. 411), it will be right to assist with forceps.

If the uterus is becoming tetanic the woman must be delivered at once, by the forceps or craniotomy. It must be remembered that in exhaustion of the uterus or in uterine tetanus turning and ergot are inadmissible.

4. *If the membranes rupture early*, as often happens, and the os is not easily dilatable by the advancing head, it must be dilated with hydrostatic dilators, Barnes's or de Ribes'.

5. If the membranes have ruptured before the physician arrives he must take care that there is no *nipping of the cervix or vagina* ; and he must *prevent rupture of the uterus or vagina* by delivering the patient at once if there are any signs that such danger is imminent (p. 489).

If in a pelvis with a conjugate of $3\frac{1}{2}$ inches or more the head is arrested at the brim, it is necessary before deciding on the form of assistance which shall be given to *see if the child is alive or dead.* If the child is dead craniotomy can be performed at once, and delivery accomplished, unless the uterus is exhausted.

If the child is alive the condition of the woman must be noticed ; and if it is good the effect of the pains may be watched for half an hour to an hour, to see if the head will mould sufficiently to come through the brim. If no advance is made the case must be treated as advised in group B.

If arrest of the head occurs in the cavity or at the outlet, the child must be at once delivered by the forceps, or if necessary by craniotomy.

Group B. The conjugate measures less than $3\frac{1}{2}$ inches ; or it measures $3\frac{1}{2}$ inches, but other diameters of the pelvis are diminished.

In such cases as these the child either cannot pass without help, or cannot pass at all.

If the head is engaged and arrested. Examine first of all to see whether the child is alive or dead. If it is alive apply the forceps, where the conjugate does not measure less than 3 inches. As modifying this general statement, it must be remembered that if the maternal passages have been too long pressed upon, after, for instance, too early rupture of the membranes, attempts at delivery by the forceps may cause further damage to the tissues, and very considerable risk to the mother from septicæmia. Moreover, it must be clearly made out that the presentation and position of the head are both favourable. If the forceps is contra-indicated under any of these circumstances, or if after a fair trial it is unsuccessful, the head must be perforated. If the child is dead the head must be perforated.

The head may not have engaged on account of considerable contraction of the pelvis, or of malposition of the head, or of uterine inertia.

If the child is alive and the conjugate does not measure less than $2\frac{3}{4}$ inches, there being no marked reduction in the other diameters ; and if there is no other contra-indication, such as over-retraction or tetanus of the uterus, the best method of treatment is to perform version. In doing this, the occiput must be induced to descend on that side of the pelvis which is found to be the larger (see p. 176, Footling). If the child cannot be delivered after version, perforation of the after-coming head must be performed.

If the conjugate is less than $2\frac{3}{4}$ inches, or if with a conjugate of $3\frac{1}{2}$ inches, the other diameters are reduced appreciably, either Cæsarian section or perforation must be done according as the woman chooses. It is recommended by some authors that forceps should be tried for a short time in cases where

turning has just been recommended ; if the case is not urgent this may be done.

Turning is of little or no use in any but flat pelves. It is an operation undertaken for the child's sake entirely ; and if the after-coming head, when it has passed the brim, meets with other obstruction lower down in the pelvis, which prevents its rapid delivery, the child cannot be born alive, and the object of the operation is not attained. It has been debated whether craniotomy is a better operation on the presenting or on the after-coming head ; most people will find it easier to do when the head presents (see p. 392, Craniotomy).

The treatment of the accidental complications of labour in contracted pelves, such as presentation and prolapse of the cord or of the limbs, and transverse presentation, will be found under their respective headings.

In certain cases of contracted pelvis the revived operation of symphysiotomy is considered by some to be suitable. This operation is fully discussed at p. 402 ; but the following statement of its object may be again made here. By dividing the symphysis about half an inch can be added to the conjugate measurement ; and since $3\frac{1}{4}$ inches may be taken as the smallest conjugate through which a living child is likely to be born, the pelvis most suitable for this operation is one with a conjugate of $2\frac{3}{4}$ inches or more. A case might be suitable, as far as measurements are concerned, where the conjugate measures more than $2\frac{3}{4}$ inches if the head refuses to engage on account of its incompressibility alone.

CHAPTER LXI

THE RARER KINDS OF DEFORMED PELVIS

THESE consist of oblique pelves ; transversely contracted pelves ; malacosteon, and pseudo-malacosteon (crumpled) pelves ; spondylolisthetic pelves ; pelves with bony or cartilaginous outgrowths into the interior ; pelves deformed by fracture ; 'split' pelves ; 'funnel-shaped' pelves.

The principle of classification best adapted for practical purposes is a clinical one, or as near an approach to that as possible.

OBLIQUE PELVES

It will be found that the want of symmetry in this class of pelvis depends mainly on an oblique transmission of the body-weight through the pelvis to the femora.

Skoliotic Pelvis.—In this case the body-weight is transmitted down that side, say the right side, of the trunk towards which the lumbar spine is

convex. In consequence the pelvis tilts so that the femur of that side comes to lie as nearly as possible in a line with the direction of the weight. The left leg has less than its share of the work, and the right leg takes the greater part of the weight of the body.

The following events are found to happen as the result (fig. 349).

The sacro-iliac synchondrosis and the acetabulum on this side are pressed together.

The leg on this side is more used, and so the in-thrust of the femur, which, as has been described, is due to muscular action, is increased.

On this side, the right, owing to the tilting of the pelvis, the out-thrust of the femur is diminished, and if there is much distortion it will become an in-thrust, for the sacro-iliac articulation will be found to transmit directly

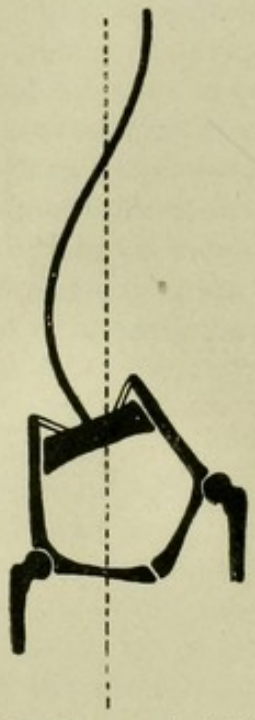

Fig. 349.—Development of skoliotic pelvis.

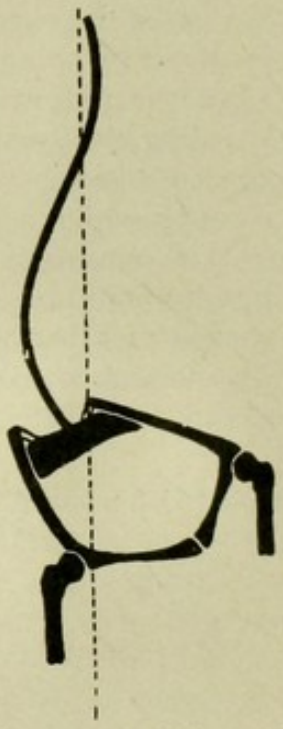

Fig. 350.—Skoliotic pelvis.

the weight of the body through its opposed surfaces, instead of allowing the sacrum to hang normally by its ligaments between the two innominate bones. There is in consequence no leverage action of the sacro-iliac beam of the affected side. On the opposite side there is a considerable amount of leverage, owing to the way in which the weight is transmitted. Between these two forces the symphysis pubis is found to be dragged over to the side, in this case the left, which does not transmit the body-weight.

The effect of this distortion is that the capacity of the affected side of the pelvis is somewhat diminished, the innominate bone being raised and turned inwards, so as to lie closer to the sacral promontory. The ala of the sacrum corresponding to the affected side is thickened and shortened, the effect of its transmitting nearly the whole body-weight (see fig. 350).

Cases where one leg is shorter than the other.—The weight of the body will be transmitted mainly through the short leg, and the pelvis will be

tilted over towards that side. The result is that the same kind of deformity is produced as in the case of a lumbar skoliosis with the convexity to that side.

Amputated or useless Leg on one Side.—The body-weight is transmitted through the pelvis on to the remaining or useful leg, and the pelvis becomes deformed as it would in the case of a lumbar skoliosis curving to the same side as that of the sound leg in this case.

Nägele Pelvis.—In this pelvis there is an absence, more or less complete, of one ala of the sacrum, with or without ankylosis of the corresponding sacro-iliac joint. The condition is due to mal-development of, or possibly, in

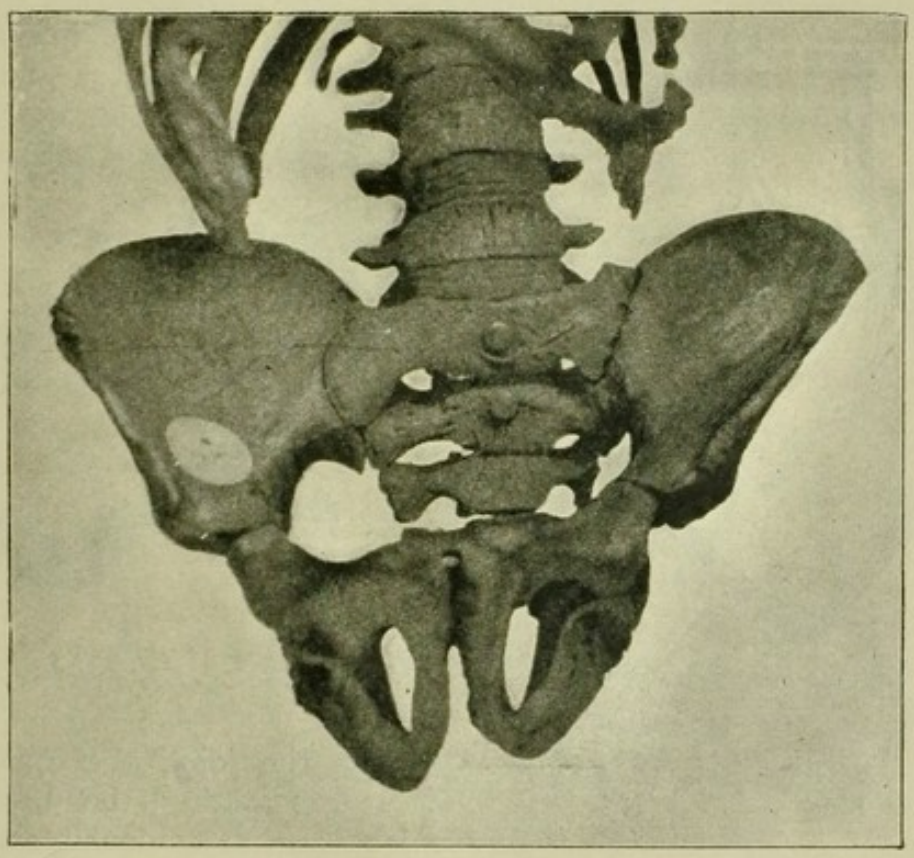

Fig. 351.—Caries of left sacro-iliac joint, causing the pelvis to develop into the Nägele shape. From a young subject. (St. George's Hospital Museum.)

some cases in which the result is almost identical, to caries about, the sacro-iliac joint (fig. 351). The mechanics of the production of this deformity are as follows. Owing to the ankylosis, or absence of the ala of the affected side, there is no lever action such as that described as existing normally from the downward and inward traction of the sacrum on the posterior sacro-iliac ligaments (fig. 352). This absence of leverage is due in the case of ankylosis to the fact that there is no movement downwards of the sacrum away from the posterior superior spine ; and in the case of the absence of ala it is due to the mechanical advantage being lost by the 'power' lying quite close to the fulcrum. On the sound side, on the other hand, the leverage is considerable, as much, in fact, as is found in the normal pelvis ; the symphysis is thus dragged over to the sound

side. On the affected side, owing to the absence of leverage, there is no tendency to bowing outwards of the pelvic beam, which therefore becomes straight. On account of the acetabulum lying nearer than normal to the middle line on the affected side, the out-thrusting component of the upward pressure of the femur disappears, and the in-thrust due to muscular action is not antagonised.

When the patient is sitting, the pressure on the tuber ischii on this side is an entirely inward one. The tuberosity thus becomes inverted, and the pelvic outlet is diminished.

The effect of these ill-directed forces is that the diseased side is considerably diminished in capacity, the sacro-cotyloid diameter being lessened. The sacrum faces towards the affected side, for sinking is prevented on that side by its ankylosis with the innominate bone, and by the fact that in cases where ankylosis does not exist, the upward pressure of the femur acts directly

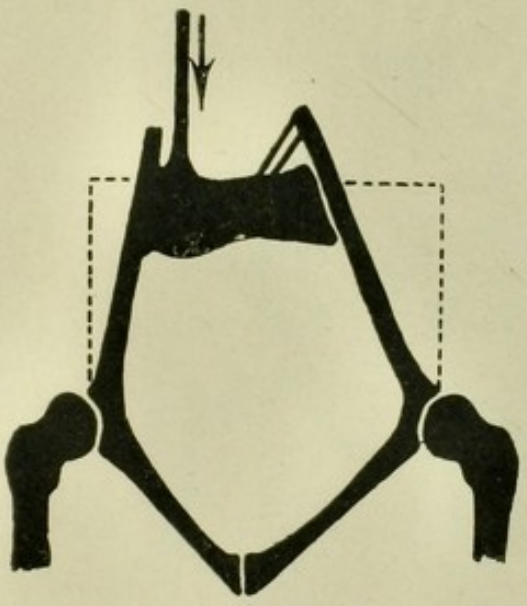

Fig. 352.—Nägele pelvis, early stage. The dotted lines indicate the direction of the upward pressure of the femora, and the amount of leverage exerted on each side at the sacro-iliac connection. The disease is on the right side.

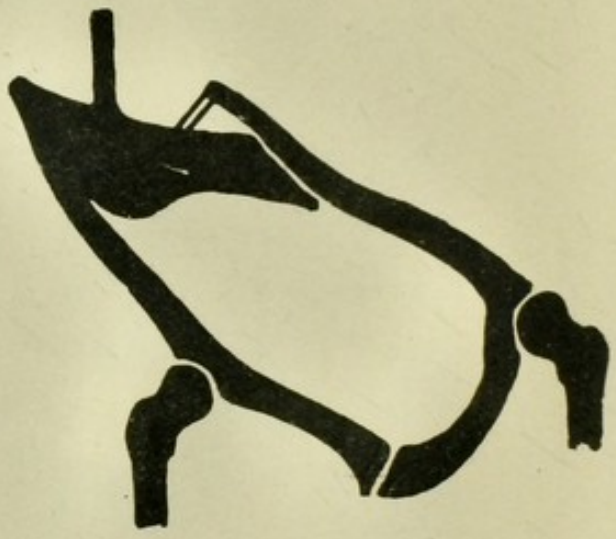

Fig. 353.—Nägele pelvis fully developed.

through the joint, the opposed surfaces transmitting the body-weight, and having no tendency to glide over one another. The pubic arch is found to be narrowed, and to be pointing towards the affected side, owing to the inward displacement of the tuberosity on that side (fig. 353).

Diagnosis of Oblique Pelvis.—If the woman have a lateral curvature of the spine to a sufficient degree to affect the pelvis, it will probably not escape notice ; or if one leg is absent or shorter than the other, a cause for pelvic deformity is easily seen. It must be remembered that any of these deformities, if it occur after the pelvis is completely developed, may have no influence in altering its shape.

Measurements of the pelvis should be made as described in the chapter on Pelvimetry (p. 416). It will be found on examining the back of the pelvis in the case of Nägele deformity that the distance between the spines of the sacrum and the posterior superior spine is much less on the affected side than on the other. On internal examination one side of the pelvis will be found to have

its sacro-cotyloid diameter much smaller than the corresponding diameter on the opposite side. This is best made out by introducing the whole hand.

Mechanism of Labour.—This depends on the particular distortion present; the head enters with its long diameter in the longest pelvic diameter available, which is as a rule that oblique diameter which starts from the diseased side; that being, if the right side of the pelvis is pushed in, the right oblique diameter. If, however, the sacro-cotyloid diameter on the diseased side is too small to admit any part of the head, labour takes place through the sound half almost entirely, and the long diameter of the head may lie more in that oblique diameter which starts from the sound sacro-iliac joint.

After the brim is passed the difficulty in all the above-described pelves, except the Nägele pelvis, is over, unless the deformity is great. There is difficulty in the lower part of the pelvis in the Nägele deformity, since the outlet is always diminished from the inward displacement of the tuberosity. If in the other cases the deformity is very severe, the pelvic outlet may be diminished for the same reason.

Treatment.—When the pelvis is deformed on account of skoliosis or affection of one leg the treatment is the same as that for flat pelvis, and turning in suitable cases is admissible. In severe cases or in cases of Nägele deformity labour must be induced at a time to be settled by the smallest available diameter if this is not too small to allow a viable child to pass. If it is impossible to deliver a viable child through the pelvis, either craniotomy or Cæsarian section must be done according to the rules already laid down, the latter being in this case by far the better operation since the woman can be sterilised at the operation.

Transversely Contracted Pelves

There are two kinds of transverse contraction of the pelvis; one being due to kyphosis of the lumbar vertebræ, and the other, first described by Robert, being due to the occurrence on both sides of that condition of sacro-iliac abnormality which, when it occurs on one side only, produces the Nägele pelvis.

Kyphotic Pelvis.—In this case the body-weight is transmitted, not through the lumbar curve as normally, but in front of the reversed convexity (fig. 354). The tendency of the weight is then to increase the backward bow, and thus force the lower end of the curve backwards and downwards. By this means the upper end of the sacrum is tilted backwards and the lower end forwards, in opposition to the normal. The pubes, however, are prevented from moving backwards by the ilio-femoral ligaments, which make a brace over

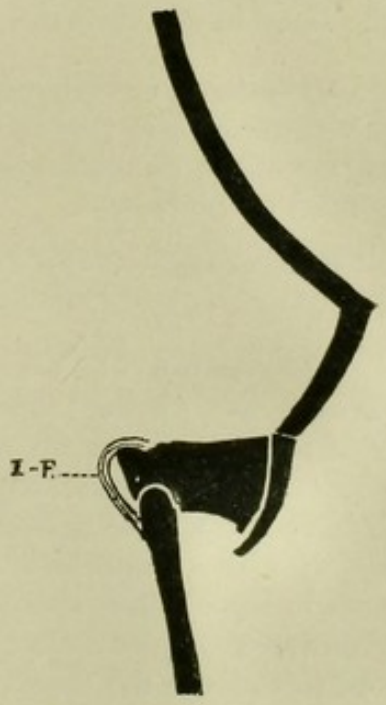

Fig. 354.—Kyphotic pelvis. *I F*, ilio-femoral ligament.

the anterior angle (*I F*). The conjugate thus becomes lengthened, and the antero-posterior diameter of the outlet diminished. The body-weight acts further in forcing the base of the sacrum back and down, so that its anterior transverse concavity is increased instead of being diminished in the normal way; and the vertical concavity is diminished for the same reason. As the sacrum does not tend to fall downwards and forwards, it cannot pull inwards the posterior end of the iliac beam, and thus the force which tends to widen the pelvis is absent. Owing to the narrowing of the pelvis on this account the outward thrust of the femora is much diminished, as is that of the tuberosities; but the in-thrust due to muscular action is allowed full play. The ilio-femoral ligaments above mentioned necessarily rotate the upper edge of the anterior part of the brim, and also the ilia, outwards; and the lower edge of the innominate bone therefore tends to turn in still further. This inward rotation of the tubera causes, when the patient is sitting, a tendency to a further in-thrust of the ischium. The effect is that, as seen in the figure, the pelvic inclination is much diminished; and the pelvis is narrowed transversely throughout. It is, however, lengthened in the conjugate at the brim, but is diminished very considerably in the antero-posterior diameter of the outlet.

Mechanism of Labour.—The mode of engagement of the head depends on the amount of narrowing at the brim, and the head as a rule passes this with its long diameter antero-posteriorly without any difficulty. When the outlet is reached there is not sufficient room between the tuberosities of the ischium, and the head may pass out entirely behind the tubera. If the lordosis above the kyphosis is low down in the spinal column (one form of pelvis obtecta) considerable difficulty may be caused to the head in entering the brim.

Diagnosis.—The spinal deformity associated with this kind of pelvis is obvious. The pelvis is generally narrow; and on internal examination narrowing of the outlet is very marked, and the promontory in all probability cannot be reached.

Prognosis.—If the deformity is marked the prognosis is distinctly bad; and 28 per cent. of the mothers in all the labours recorded died.

Treatment.—In cases of slight deformity the forceps is the best instrument to use, for the lateral compressing action which it exerts on the head is in this case most favourable. Version is quite unsuitable for the same reason as in the generally contracted pelvis. If the deformity is considerable craniotomy will be necessary, and this must be followed by the cephalotribe, which also compresses the head in the best direction. If the case is seen in time labour should be induced at the proper moment as calculated from the available space. The best treatment of all is to do Cæsarian section and to sterilise the woman.

Robert's Pelvis.—This is an extremely rare form of contraction. Its cause is incomplete development or absence of the lateral masses of the sacrum, and it is thus a kind of Nägele pelvis. There is ankylosis on both sides, and owing to this there is no force tending to widen the pelvis by the

leverage action of the innominate beam. The pelvis is also narrower by the width of the lateral masses of the sacrum. The sacrum lies rather forwards, and its vertical curve is much flattened.

It is diagnosed by the general narrowness of the pelvis in every measurement.

Treatment.—If the case is seen early enough, that is not later than about the fifth month, labour must be induced. If later than this, since operative measures in such a narrow pelvis where the head cannot possibly descend below the level of the brim are more dangerous to the mother than the Cæsarian section, this last operation is the proper procedure.

Triradiate Pelves

This group includes two forms: the malacosteon pelvis; and the ricketty form which, from its resemblance in some respects to the malacosteon, is called a pseudo-malacosteon pelvis.

The Pelvis of Mollities Ossium, Osteo-Malacia, or Malacosteon shares in the bone-softening which affects the rest of the osseous system. In consequence of this softening the changes which have been described as those of development are in a degree renewed, and become exaggerated. As the body-weight is transmitted through the sacrum and the upward pressure of the femora meets this the pelvis is squeezed in at the three places of application of these forces. In addition to this the muscles connecting the femora to the innominate bones tend when in action to pull outwards the points of their attachments.

Causation.—Mollities ossium is a disease endemic in certain places in Europe. It is hardly ever seen in this country. The disease has been supposed to be due to insanitary conditions; but little is known about it.

It occurs in the female only, and almost always in connection with pregnancy and lactation. It is very rare in first pregnancies.

Pathology.—In this disease the whole bone is softened, and it thus contrasts with the bone of rickets, in which the softening is only found at the ossifying planes. Sometimes in the intervals between the pregnancies the bone hardens again; but this is uncommon, and the disease usually increases. It consists in the absorption of the calcareous salts, and though the amount of the disease may vary in different bones, those usually most affected are the bones of the pelvis and spine. It has been found in many cases where during the disease the ovaries have been removed, in Porro's operation or otherwise, that the patients have recovered, and the bones have hardened in the shape they possessed at the time of the operation.

Effect on Pelvis.—The body-weight forces the sacrum downwards and forwards, at the centre of its base more especially, and the sinking may be so extensive as to bring the fourth lumbar vertebra down to the level of the brim. The sacrum drags the posterior iliac spines with it to some extent, and

these may yield so as to allow the sacrum to become more or less dislocated off the auricular surface of one or both sides. The sciatic ligaments pre-

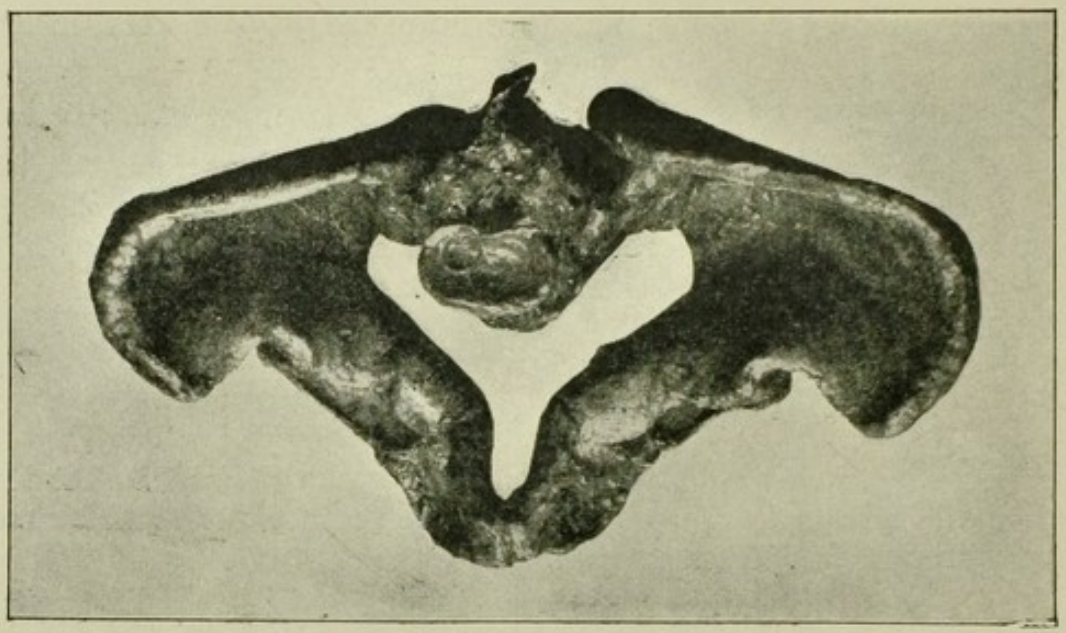

Fig. 355.—Malacosteon pelvis, seen from above.

vent any recession of the lower end of the sacrum, so this bone becomes much curved, and the coccyx projects far forwards between the tuberosities, which are somewhat pulled backwards.

The acetabula are pushed inwards, the pubic rami yielding at their weakest point, namely, just over the foramen ovale. The anterior part of

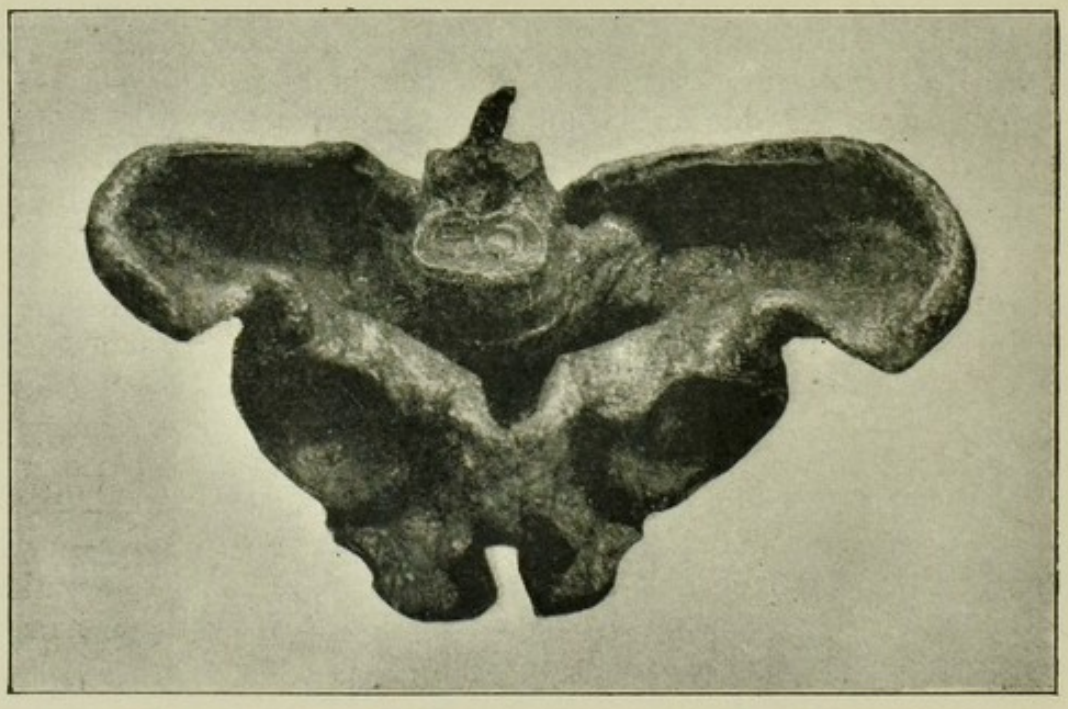

Fig. 356.—Malacosteon pelvis, from the front.

the brim thus becomes beaked, and the acetabula approximate to one another and look more forwards (fig. 356). When the acetabula are driven

in beyond a vertical line dropped from the sacro-iliac synchondrosis there is nothing to antagonise the inward thrust, and the distortion is further increased.

The action of the muscles is shown by eversion of the rami and tubera of the ischial bones. The pubic bones are pulled forwards by their muscles, and the ilia are everted ; but as the ilia have their anterior ends approximated by the inward movement of the acetabula, the result is that the curve of the crest of the ilium is much increased (fig. 355).

Since the sacrum comes forward the inclination of the pelvis is necessarily diminished. These deformities are mainly produced while the patient is walking or standing, seeing that adults only are attacked.

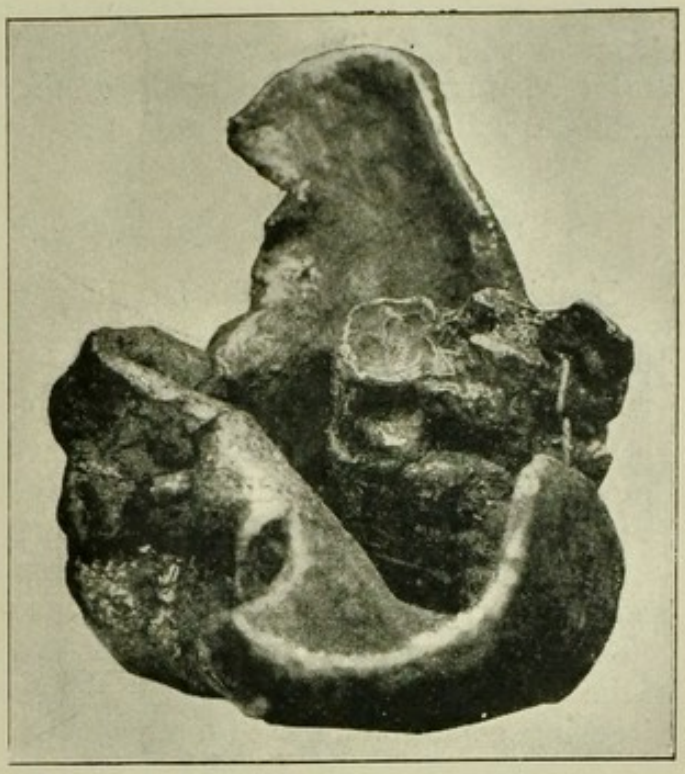

Fig. 357.—Malacosteon pelvis from the side and slightly above.

The diagnosis of this pelvic deformity is made by the rapid appearance of distortion, and also of tenderness of the bones beginning in pregnancy or lactation. The pelvis is easily recognised by internal and external examinations.

Treatment.—If the disease is discovered early in pregnancy, and is advancing, labour should be induced at once ; but if only at or near term an attempt may be made to dilate the pelvis sufficiently by the hand to allow the head to pass. In severe cases the bones yield readily to a small amount of force. If the head cannot be delivered in this way craniotomy may be done. Porro's modification of Cæsarian section is by far the best to use as far as regards the ultimate results of the case, for it often cures the disease, as just stated, whereas the other methods allow of repeated pregnancies, and these may bring about an increase in the diseased condition.

Pseudo-Malacosteon Pelvis, Triradiate Rachitic.—This rare condition is found in cases where the ricketty state has persisted after the child can walk and stand, so that the bones are more generally softened than usual.

The pelvis resembles in general outline the malacosteon pelvis, but is smaller owing to the defect of growth caused by the disease. The ilia are not curved in at their anterior ends, as the bones are not soft enough to be appreciably pushed inwards at the acetabula.

The relation of the inter-spinous to the inter-cristal measurements is therefore that common to all ricketty pelves (p. 417).

The deformity, owing to the less complete softening of the bones, is never so severe as in bad cases of malacosteon.

The diagnosis is made by finding, in a pelvis which has most of the characters just described as belonging to the pelvis of osteomalacia, that the inter-cristal and inter-spinous measurements have the relations characteristic of rickets ; and that the woman shows signs of rickets in other bones.

Treatment.—If the case is seen early induction should be performed ; if later craniotomy or Cæsarian section, according to the choice of the woman. Cæsarian section will be necessary if the head and pelvis are much disproportioned, for there is no compensatory widening in any diameter, and the bones will not yield to dilatation as they would in a malacosteon pelvis.

Spondylolisthesis (σπόνδυλος, a vertebra, ὀλισθεῖν, to slip)

In this kind of pelvis the last lumbar vertebra has slipped forward off the sacrum to a greater or less extent, and occupies a part of the pelvic inlet.

Until this subject was studied by Neugebauer[1] no satisfactory reason had been given for the deformity. He believes and proves that the slipping is due to two factors ; a predisposing one, consisting in a congenital deficiency in that part of the arch between the superior and inferior processes of the last lumbar vertebra ; and then the imposition of any great weight in the abdominal region which drags the spine downwards and forwards, such as repeated pregnancies, obesity, carrying heavy weights, or violent driving down of the spinal column, may dislocate the vertebra off the sacrum. The predisposing condition is known as spondylolysis (λύσις, a loosening), and is not so very rare. The deficiency may consist in a failure of the cartilage uniting the two processes to develop into bone or a deficient development of the bone. In one of the specimens that Neugebauer showed the vertebra had become displaced forwards on one side, where there was such deficiency, and not on the other. The lower articular process with the neural arch remains attached to the sacrum, and the rest of the vertebra slips forwards to a varying extent. Spondylolysis occurs in other parts of the spinal column ; but it concerns us in this part only, and here it is also most common.[2]

Resulting Changes.—Owing to its slipping forward and downwards the fifth lumbar vertebra rotates on a transverse axis so that its anterior surface looks downwards, and thus lordosis of the rest of the lumbar vertebræ is produced. The hinder part of the vertebral body bears the body-weight which is transmitted through the fourth lumbar ; it is therefore compressed from above downwards. The strain in the new direction on the intervertebral cartilage between the fifth lumbar vertebra and the sacrum causes ossification of the ligaments on its sides, and of the disc itself. The disc is also

[1] See *Obst. Trans.* vol. xxvi. p. 186.

[2] Targett's case (*Obst. Trans.* vol. xxxiii. p. 108) shows that spondylolisthesis may occur in consequence of fracture of the pedicles. In his case, that of a girl aged sixteen, the pedicles of the third, fourth, and fifth lumbar vertebræ had given way, and the vertebræ were dislocated forwards. W. Arbuthnot Lane (*Path. Trans.* vol. xxxvi. p. 364) considers that pressure alone is able to produce this deformity without any previous congenital deficiency.

depressed by the inferior posterior edge of the body of the fifth lumbar vertebra. There is ossification too of the remaining attachments of the arches of the vertebræ above it to the body of the displaced fifth vertebra. The alterations caused in the pelvis generally are as follows: Since the body-weight is transmitted more to the front the pelvic inclination is diminished (see p. 451). The weight now so falls as to press the top of the sacrum backwards, and so the lower end comes forward and diminishes the antero-posterior diameter of the outlet (fig. 358). The sacrum is also pushed bodily backwards, and thus drags on the sciatic ligaments, and diminishes the transverse diameter of the outlet. It also sinks between the ilia in the direction of its length, and separates them like a wedge. As happens in the kyphotic pelvis the diminished inclination causes over-action of the ilio-femoral ligaments, which everts the ilia and adds to the narrowing of the outlet.

The pelvis is thus not unlike the kyphotic pelvis in a general way, except that the inlet is diminished in its conjugate diameter instead of being increased.

Fig. 358.—Spondylolisthetic pelvis.

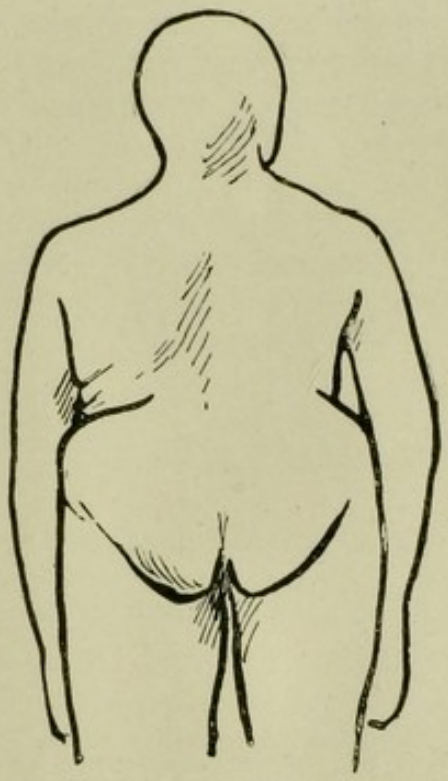

Fig. 359.—Back view of a woman with spondylolisthesis. (After Winckel.)

Diagnosis.—In well-marked cases this can be made from the external appearance of the woman. On looking on her back from behind it appears as if the whole of the upper part of the body were telescoping into the pelvis. The figure seems peculiarly short, there is lordosis in the lumbar region, and the ribs are near to or even sunk into the false pelvis; the upper and back part of the sacrum is very prominent (fig. 359).

On examining per vaginam the dropped vertebral body can be felt in the brim. It is distinguished from the promontory in a case of marked reniform pelvis by the sacrum being felt externally too far back; and by there being no lateral mass on each side of the projection into the brim on internal examination. There is often also a history of injury of some kind, or of habitually carrying heavy weights.

Treatment.—Labour in slight degrees of this deformity may go on unaided; but as the cases become more severe they will need treatment in

corresponding proportion. Labour should be induced where this is possible; forceps, craniotomy, or Cæsarian section may, according to the reduction of the available space, be one or other of them necessary. Version is not admissible on account of the diminution of the outlet.

Irregular Forms of Contraction, Exostoses and other Outgrowths.—Bony or cartilaginous growths, innocent or malignant, may in rare cases encroach on the pelvic canal. They may give no sign of their existence externally, or they may co-exist with tumours of a similar kind in other parts of the body.

In osteo-arthritis there are sometimes projections of spiculæ of bone on the pubic rami in the situations of the ligamentous attachments. Spicules or irregular projecting masses may lacerate the uterus if the lumen of the pelvis is much contracted, and so great care should be taken during delivery in these cases. Craniotomy and even embryotomy should be performed if there is any difficulty. Cæsarian section, however, is the best operation by far if the obstruction is great.

Fractures of the pelvis may lead to irregular union, or some of the callus may be unabsorbed, thus causing various deformities.

CHAPTER LXII

ABNORMALITIES IN THE PASSAGE (*continued*)

Soft Parts

Bulging of the Anterior Wall of the Lower Uterine Segment.—In this case the head descends into a pouch formed by the bulging, and the os remains high up and directed backwards.

It is caused by premature rupture of the membranes; the anterior lip of the cervix is caught, as the head descends, between this and the pubes, so that the part of the cervix below the point where it is nipped cannot be withdrawn off the head as this descends into the pelvis before the cervix is dilated. The anterior wall of the cervix may thus be crushed and slough, or may be torn off.

Cases have been mistaken, owing to the difficulty of finding the cervical orifice, for complete atresia; and incisions have been made over the bulging anterior vaginal wall. In slighter degrees of nipping œdema of the anterior lip may be found, and is not an uncommon phenomenon.

Treatment.—The woman must be placed on her side and told not to bear down. The anterior lip should be gently pressed forwards (and upwards) during the pains and in the intervals so that it is brought to lie in its normal position. This manœuvre may necessitate the use of chloroform. If the os cannot be brought forwards it should be dilated with hydrostatic bags.

Bulging of Posterior Wall of Uterus.—The os is high up in front, and lies behind and above the symphysis, and a pouch is formed in the posterior wall. Depaul[1] found in a case of this kind the posterior wall lengthened on measurement post-partum. He considers it due to sacciform development of this part during pregnancy. Barnes, on the contrary, says the condition consists in incomplete retroflexion existing during pregnancy ; he believes that the uterus has its anterior wall pulled up by the body of the fœtus while the head lies in the pelvis ; and the tilting upwards of the cervix is thus accounted for.

The *treatment* is practically the same (*mutatis mutandis*) as that for bulging of the anterior wall.

New Growths of the Body of the Uterus.—Only myomata are of interest, for cancer of the body is too late in its appearance in the great majority of women's lives to concur with pregnancy. Myomata have been supposed to interfere with the expulsive power of the uterus, but it has been shown[2] that they have little or no effect in this way ; and this has been the writer's experience.

The presentation of the child is affected by them sometimes. The only accident that is likely to occur is post-partum hæmorrhage ; and to prevent this the uterus must be very carefully watched during and after the third stage of labour. Sloughing of the tumour is sometimes caused by the pressure during labour. Rupture of the uterus is possible, owing probably to the thinning of the real uterine wall by the fibroid ; and if the myoma is polypoid inversion of the uterus may occur. Uterine fibroids have been said to be one cause of placenta prævia, owing to the increased size of the uterine cavity.

Treatment.—If the tumour is in the way of the head at the brim it must be pushed up, if possible, so as to allow the head to come down. To do this the woman may be placed in the knee-elbow position. If reposition cannot be accomplished under anæsthesia, it may be necessary, if the child is alive, to perform version ; or in some cases the tumour may be removed by enucleation ; or Cæsarian section or Porro's operation may be required.

Sub-peritoneal fibroids if they lie below the head are to be treated, when they have a pedicle, as ovarian tumours, and pushed up.

Atresia of the Cervix.—When complete occlusion of the cervix is present it must of course have taken place after conception. This very rare condition is due to some form of traumatism, such as the application of caustics, and subsequent cohesion of the surfaces. Care must be taken not to confuse it with the two kinds of bulging just described.

Treatment.—After a very careful examination an incision is to be made at any spot indicating the position of the cervix ; or, if there is no indication, at the centre of the bulging surface.

The orifice thus made can be somewhat dilated with Hegar's dilators ; and then with hydrostatic bags. If the membranes will dilate the orifice thus made they should be allowed to do so ; if not, dilatation may be completed by the bags. The incision should, if possible, be made through cicatricial

[1] *Arch. de Tocologie*, 1876.

[2] Hofmeier, *Zeitsch. fur Geb. u. Gyn.* vol. xxx. 1894.

tissue only, the layers being divided slowly while the part is exposed by a Sims' speculum.

'Rigidity' of the Cervix.—Only the conditions usually classed under organic rigidity will be described here. The so-called 'spasm' of the cervix has been mentioned on p. 88.

It is a question whether or not the often difficult dilation in elderly multiparæ is really organic.

Rigidity or resistance to dilatation may be due to (1) malformation of the cervix; (2) cicatricial changes in the tissue of the cervix; (3) changes in its walls in connection with supra-vaginal elongations; (4) new growths; (5) (?) rigidity in elderly primiparæ.

(1) *Malformations.*—There are two conditions described;—(*a*) *congenital elongation of the portio vaginalis* (fig. 360); and (*b*) what has been considered as congenitally small os externum. The former no doubt exists, and has been observed in connection with slow dilatation of the cervix. The latter is only conjectural.

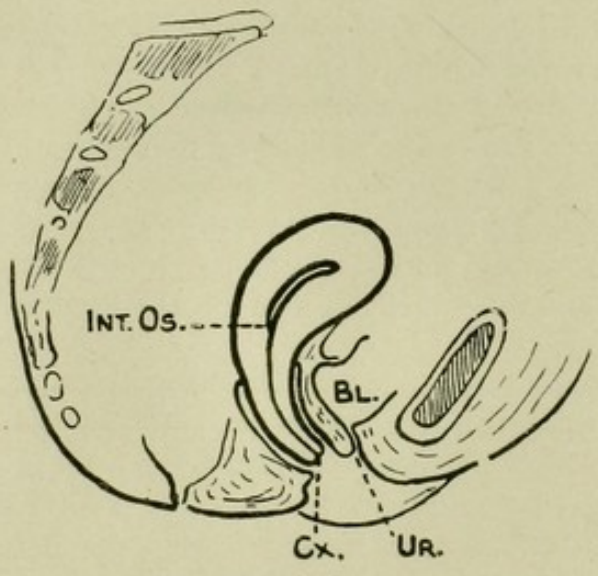

Fig. 360.—Congenital hypertrophic elongation of cervix. *Cx*, cervix (external os); *Ur*, urethra; *Bl*, bladder.

The treatment is, after allowing a fair time [say in the former (*a*) four or five hours] without any advance of the head; and in the latter after dilatation of the cervix has reached the external os and the cervix has disappeared, but there is no progress for two hours (in each case there being no other discoverable reason for delay) to dilate the os with bougies (Hegar's or others) or with the finger, when this can enter the cervix; and then with hydrostatic dilators to nearly the size of full dilatation. The membranes after this will bulge, and labour will be completed spontaneously.

(2) *Cicatricial changes* may occur after severe cauterisation of the cervix; after amputation; or after deep ulceration (of some cases of which syphilis has been considered the cause). The lacerations caused by previous labours do not produce 'rigidity.'

The treatment of these cases, after allowing labour to proceed until the cervix is obviously the impediment to further advance, is to carefully make radial incisions through the cicatricial tissue.

(3) Changes in the walls in connection with *elongation of the supra-vaginal cervix* (due to prolapse of the vagina).

This consists in an increase in the proportion of fibrous tissue. The os usually dilates slowly, and nothing further abnormal occurs; but the anterior lip of the cervix may become œdematous, getting nipped between the head and the symphysis pubis; or the cervix may be driven down and may slough or may be actually torn off. The right treatment is to dilate the cervix with tents or hydrostatic bags; or, if the tissues are very resistant incisions

should be made towards the sides to avoid opening the peritoneum in Douglas' Pouch.

(4) *New Growths.*—Polypoid myomata (fibroid polypi) are found in the cervix or in the vagina very rarely; they should be cut off with scissors before the head descends.

Myomata of Cervix.—These are very rare. Their effect on labour depends on their size. If small (the size of a filbert) they do not interfere to any extent with labour; but it is possible that they occasionally cause spasm. If they are larger than this they may hinder dilation, or may prevent the head entering the cervix. They are most troublesome when they are sub-peritoneal, and, not being drawn above the brim as the uterus retracts, block up the pelvis completely. If the tumour is submucous and is forced down by the advancing head, its attachment is stretched and may rupture. In any case the mass may be removed by a pair of scissors without fear of hæmorrhage.

Any fibroid which has survived labour should, if at all crushed, be removed immediately labour is over. If it is not damaged and not, as occasionally happens, spontaneously expelled, removal should be accomplished as soon after labour as is convenient, one to three months being a fair time to allow.

Cancer of Cervix.—This may be only incipient, or it may be advanced. If the former, especially if the cancer is soft, it does not cause much hindrance, and dilation takes place much as usual. If the cervix is involved completely dilation is absolutely prevented, and symptoms of obstructed labour appear. If the mass is a large one, whether due mainly to growth in the cervix alone, or partly or mainly to infiltration of the connective tissue around, it may prevent delivery even after the os itself is made large enough.

Incisions should be made through the diseased tissues, so as to allow the bag of membranes to form, and it will then be seen whether dilation is progressing. Incisions are better than artificial dilatation, for the infiltrated tissues will tear irregularly and there will be sloughing. If after the incision the bag of membranes will complete dilatation it should be allowed to do so. If not, further incisions must be made laterally, and then the opening will allow the hand to pass without much tearing, or will enable the forceps to be used. If the mass is immovable, or if no opening can be made of sufficiently large size, the best plan is to do Cæsarian section. Craniotomy is not good treatment: the child is thus sacrificed for no advantage, since the mother will doubtless die from septicæmia, due to sloughing of parts of the tumour.

Cutting away of projecting masses is useful where it is of service in making a passage, and especially where the cancer is limited to the lower part of the cervix. No appreciable hæmorrhage occurs.

Vagina. *Displacements.*—The commonest displacement occurring in the vagina is that of the anterior wall, a cystocele being formed. This is occasionally found to project through the vulva. It may be recognised at once by passing a sound or catheter through the urethra and into the cystocele. The urine can then be drawn off, and the tumour pushed up if this is necessary. It has been incised in mistake for the bag of membranes.

In addition to the delay it causes there is the danger that it might slough if it were carried down in front of the head, and subjected to long pressure in this position.

The posterior wall of the vagina is very rarely found to be prolapsed. If such a prolapse is extensive the rectum may bulge from the vulva, or even a coil of intestine may come down in Douglas' pouch and project externally, covered by the tissues of the vaginal wall only. The diagnosis of rectocele is readily made by passing the finger through the anus. Less danger accrues from prolapse to the bowel than to the bladder, since there is no unyielding part like the back of the symphysis against which the head can press the base of the tumour and cause strangulation. The rectum may be emptied by an enema if necessary, and the prolapsed part then pushed up.

In the case of enterocele the diagnosis is also easy.

The patient should be placed in the genu-pectoral position and the intestine can be restored. If it cannot be restored forceps should be applied so as to obviate prolonged pressure by the head.

Atresia. Stenosis.—When atresia of the vagina is found it must have been produced since impregnation. The so-called 'diphtheritic' inflammation complicating cases of enterica or small-pox occurring during pregnancy have been known to cause this ; and Spiegelberg mentions a case in which impregnation had taken place through the urethra after operative closure of the lower end of the vagina for vesico-vaginal fistula.

Stenosis is far commoner than atresia, for impregnation may occur through a very minute opening. This narrowing of the canal may result (rarely) from damage at previous labours ; or from congenital bands, septa, more or less complete, or narrowness, or from cicatrices after syphilitic ulcerations.

The chief danger in labour is that the tissues, if cicatricial, do not dilate at all ; and in congenital cases the orifice may be so small as not to be able to dilate sufficiently. In consequence very deep lacerations will occur.

Treatment.—An attempt must be made to stretch the stenosed part with dilators, beginning with tents if the contraction be very severe. If there are any obvious bands they should be divided with blunt-pointed scissors, guiding the incision by the finger introduced into the rectum.

If neither division of bands nor stretching seems likely to be of much use, the effect of a few pains should be watched where this can be safely done, and then if necessary the child's head must be perforated and extracted with craniotomy forceps. In certain cases where the stenosis does not yield sufficiently to make the delivery of even the perforated head and the body a safe procedure, Cæsarian section is the right treatment to adopt ; and this operation will be necessary in cases of atresia.

Even slight stenoses of the vagina are very troublesome in cases where obstetric operations, such as turning, are necessary.

Cysts and other Tumours.—Vaginal cysts have to be diagnosed from cystocele and rectocele, and must be incised if they are likely to cause any obstruction.

Tumours of the vagina, if removable, must be excised according to circumstances.

Unruptured Hymen.—Impregnation is of course possible without penetration ; in other cases when the hymen is formed entire it may have yielded inwards to some extent, or penetration may have occurred without rupture.

If it is found to be very thick and tough, it is best to cut it through radially, since, if no assistance is given, the tears caused by the head being forced through its orifice may involve the nymphæ very deeply.

Vaginismus, Spasm of Anterior Fibres of Levator Ani.—Spasm may occasionally occur during labour, and arrest the head (see Levator Ani, p. 87). In this case a tense ridge will be found on each side of the vagina, about an inch from and almost parallel to the plane of its orifice. In the treatment of this the exercise of patience, and the administration of chloroform as soon as it is rendered necessary by the persistence of the spasm, are all that is necessary.

Perinæum.—The perinæum is occasionally rendered undilatable by cicatricial changes, which may be extensive enough to render dilatation impossible. In this case the best treatment is to make incisions which are as near the middle line as possible, and include the whole thickness of the perinæum. If the centre of the perinæum is entirely converted into cicatricial tissue, it is perhaps better to make the incision slightly to one side, through as healthy tissues as possible, so that the healing may be rapid.

If there is no cicatricial tissue, but the perinæum is only congenitally long or thick, it will yield in time, and in all probability will not be much assisted in yielding by the application of hot fomentations or similar measures (see Episiotomy, p. 192).

The perineum, like other parts of the vulva, is sometimes œdematous in cases of albuminuria. The forceps may be used if the swelling is not considerable, but if it is, and crushing of the tissues as the head passes is probable, it is good practice to puncture the œdematous parts in many places with a needle, and allow the fluid to drain. Before this is done the parts must be made aseptic, and must be kept so afterwards.

Malformations of the Uterus and Vagina.—Stenoses have already been described. The bi-cornute uterus with pregnancy in an undeveloped horn has been dealt with under 'Ectopic Gestation.' If the developed horn alone becomes pregnant, labour is not affected unless possibly by lateral deviation of the uterus.

Double Uterus.—Pregnancy has occurred in all forms.

The main varieties of double uterus are represented in the diagrams (pp. 294, 295). One or both halves of such uteri may become gravid if they are quite separate ; and where the vagina on one side is occluded, hæmatometra and hæmoto-colpos have been found in combination with pregnancy.

In these cases of mal-development pregnancy is, as a rule, little, if at all, interfered with (see p. 293). In labour obliquity of the uterus is common, caused either by the pregnant half diverging from the middle line, by the unimpregnated half prolapsing into the pelvis (where it may act as a mechanical obstacle), or on account of deficient development of the fundus ; or obstruction may be caused by the vaginal septum, in cases where this is present.

Where both halves are pregnant labour may occur at different dates (see

Superfœtation, p. 76) ; and where labour is going on in both at the same time the contractions in the two halves are not necessarily simultaneous. When one half only is impregnated the other half, when labour occurs in the impregnated half, often expels the decidual membrane developed in it (compare what happens in Ectopic Gestation, p. 323).

Where the division between the two halves is incomplete the placenta may be found in one part of the uterus, and the fœtus more or less entirely in the other.

The cephalic lie is by far the commonest in all these cases, but is not nearly so constant as in the normal uterus.

Diagnosis.—This is often not made. Where the vagina is completely double with a double os there can be no doubt ; if the vagina is single and the portio vaginalis is very wide, with possibly two external ora to be felt, suspicion may be excited.

On examination by the abdomen, if the two halves of a double uterus are pregnant, a well-marked median furrow may be observed. This is seen best when the uterus is contracting. If only one horn is pregnant the condition cannot be diagnosed per abdomen. If it is possible to make out the round ligaments during a contraction, their relation to the part of the uterus occupied by the ovum should be observed (see figs. 274 and 275, p. 323).

During the puerperium these mal-developments are more easily made out, owing to the relaxed condition of the abdominal wall.

There is no special treatment required.

Abnormalities in the Surrounding Parts

Bladder. (*a*) *Retention of Urine.*—The causes of this have been mentioned in Normal Labour. Its effect may be to deviate the uterine axis slightly, and it must prevent the changes in the position of the bladder which normally occur in labour (p. 118).

The diagnosis will be made by the history of the case and by examination of the abdomen, and by passing a catheter.

(*b*) *Vesical Calculus.*—This is very rare, but a stone has been found which was large enough to obstruct labour. Its effects would be especially bad if it lay in a cystocele, or if it were impacted in the external orifice of the urethra, as in such cases the parts would be very badly bruised.

Diagnosis.—This will be made in the ordinary way with the sound, after finding a hard mass contained in the bladder and moveable within certain limits.

Treatment.—If possible, the stone should be pushed above the brim ; but if this cannot be done the urethra must be dilated and the stone extracted. If the stone is too large to be dealt with in this way vaginal cystotomy must be performed. Crushing is not the best treatment in these cases, for it may involve great danger to the soft parts.

Ovarian Tumours.—The history of ovarian tumours during pregnancy will be found on p. 291, and the diagnosis and treatment are there fully explained.

During labour the dangers which arise from their presence are due to

(*a*) the obstruction they cause to the passage of the fœtus; and (*b*) the damage they themselves may sustain.

The gravity of the results from their presence depends on their position and their fixation. The most dangerous state of things is where there is one small enough to lie in the pelvis, firmly adherent to surrounding structures, or where a part of a large one lies in the pelvis; large ones which have already risen out of the pelvis need cause no trouble if they are not mistaken for something else, as, for instance, an ectopic gestation coexisting with intra-uterine pregnancy.

As a consequence of the pressure and bruising brought about by the passage of the child in cases where the tumour is in the way, it may rupture, slough, or bleed internally. If it is a dermoid it will almost certainly suppurate if damaged.

Treatment.—A tumour *below the brim* should, if possible, be pushed up above it, and help will be obtained by posture and by the use of an anæsthetic. In some cases the forceps may be applied while the tumour is held up until the pelvis is filled by the presenting part. If the tumour is immoveable, the best thing is to do vaginal ovariotomy; puncture is recommended by some, but it has many dangers (see p. 292).

If the tumour is large and the main mass *above the brim*, but is obstructing labour by reason of its bulk, ovariotomy should be done as soon as possible; if there are no means of doing this we must be content with a tapping; but tapping is to be avoided if possible on account of its dangers and unsatisfactory results. If there is any doubt as to the tumour being an ovarian cyst the best treatment is still to do an exploratory operation. Some would do craniotomy on the child, deliver it, and then deal with the tumour afterwards; but unless the body of the child will come through pretty easily after craniotomy, the tumour is likely to be dangerously bruised, which will bring about a fatal result; whereas ovariotomy gives a good chance of saving both the mother and the child.[1]

CHAPTER LXIII

C. ABNORMALITIES IN THE OVUM AFFECTING LABOUR

THE fœtus and its appendages may be abnormal in various ways which interfere with the natural progress of labour. Such are: unusually large size of the child, or of some of its parts as in hydrocephalus; monsters; hydramnios; very short cord; and others which will be found described in this chapter; or the difficulty in labour may be due to faulty lies, especially transverse ones, or faulty attitudes, as when the arm is displaced.

[1] *See* a case described in *Trans. Obst. Soc.* vol. xxxiii. p. 140.

DEFORMITIES AND DISEASES OF THE FŒTUS

1. Large size.
2. Local enlargements.
3. Monstrosities, single or double.

1. **Large size.**—Many children weighing as much as nine or ten pounds are born without any great trouble, often without a rupture of the perinæum, even in the case of primiparæ. The reason of this is that the excess of bulk is due to the volume of the trunk ; and that the bones of the head at all events are not much, even if appreciably, increased in size ; though the head may seem large owing to excess of the soft parts, especially about the cheeks and lower part of the face. Such children are also, as a rule, the offspring of well-developed mothers.

Signs.—The head, in cases where the skull is really enlarged, may be unable to enter the brim. This state of things gives rise to the same conditions as an equal relative disproportion caused by a contracted pelvis. It is a very rare event. There is no way of anticipating it, for measurements of the length of the fœtal ovoid by callipers will not help us, many children being born with no trouble which have an increased length as measured in this way. In cases where trouble from this cause is known to have occurred in any previous pregnancy, it may be possible to find out the moment at which premature labour may be induced by causing the woman to come and be examined about a month before full time, and seeing if the head can be made to enter the pelvis by pressure from above (see p. 439). When this is becoming difficult, but before it is impossible, labour should be induced.

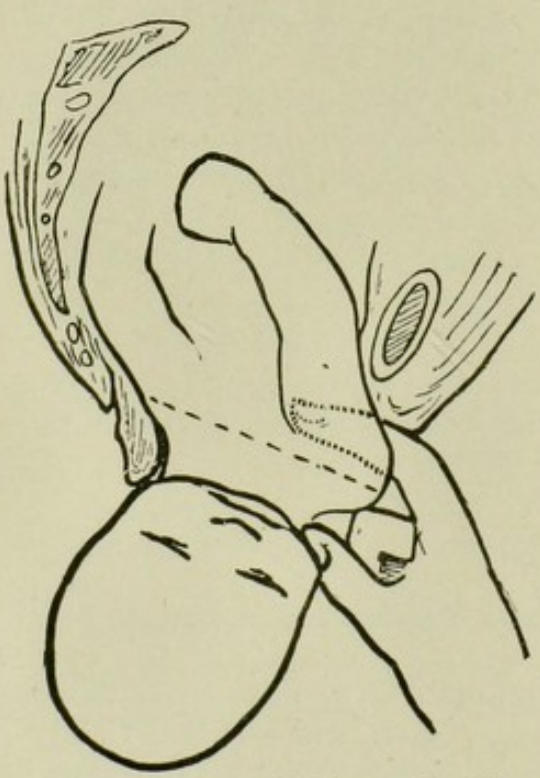

Fig 361.—Bisacromial diameter freed by traction applied to anterior axilla.

Treatment.—An attempt should be made to extract with the forceps ; if this is not successful, or if the forceps cannot be adjusted, perforation is the only resource. Such a child could not be delivered alive by turning, for the shoulders would cause much delay, and there would be such pressure on the cord, that the child would be asphyxiated ; to say nothing of the danger to the mother caused by the operation under the circumstances. After the head is perforated, it may be necessary to perforate the thorax as it becomes accessible ; or to cut off an arm and thus reduce the width of the shoulders.

The head may enter the brim, and be born with more or less difficulty, and then the shoulders may become impacted. There is here no doubt, if the pains are good, that the delay is due to the size of, or to some abnormality in, the trunk.

In this case the forefinger should be hooked in the anterior axilla, and

this should be pulled upon, attempts being made at the same time to rotate it forwards under the pubes. If it will come down, the bisacromial diameter will have been tilted so that it comes through obliquely, after the fashion of, and having the same mechanical advantage as, the obliquity of Nägele in the case of the head (fig. 361).

If the anterior axilla cannot be reached, the posterior one must be tried, and the head must be pulled forwards, so as to induce obliquity of the bisacromial diameter, but in the opposite direction. Better results will be obtained if the anterior axilla can be hooked down, for the anatomy of the pelvis will allow of movement of the trunk backwards more readily than forwards, since the pubes are in the way of the latter movement.

As soon as one shoulder is in advance of the other, the two forefingers can be employed, one in each axilla. The perinæum is not unlikely to be torn, but this cannot be helped.

If it is possible to draw down an arm or both arms altogether, and thus diminish the shoulder girth, so much the better ; but this will seldom be possible. In making traction great care must be taken that the finger is 'home' in the angle of the axilla, or the humerus may be fractured ; and in bringing the arm down over the chest and past the head, the elbow is the point on which pressure must be exercised, for the same reason.

If the shoulders are arrested at the brim, the head not being born, an attempt must be made to deliver the head with the forceps, and if this is successful the shoulders must be treated as just described ; but if the shoulders cannot be delivered, the blunt hook (p. 386) should be used either for traction, or to bring down one or both arms.

If, in spite of all attempts, no progress is made the thorax must be perforated.

In some cases of large children the otherwise normal labour may be modified by *unusually advanced ossification of the cranial bones.* As already stated, this condition is more likely to be present in male than in female children, and in the children of middle-aged women than in those of younger ones. Such cases may be recognised by the small size of the anterior fontanelle if this can be reached ; or the hardness of the bones may be made out by examining their edges.

If the child presents by the breech, there is not much hope of saving it, for the cord is, as a rule, compressed so much and for so long that asphyxia is produced. If delivery is not possible within a few minutes (see p. 201), the fœtal heart must be frequently examined during the attempts, and directly death occurs evisceration may be done at once.

2. **Local enlargements.**—This class includes cases of hydrocephalus ; of excess of fluid in other cavities, and in the connective tissue ; and tumours of the fœtus.

Hydrocephalus

The degree to which the cavity of the skull is distended varies within very wide limits. It is sometimes enough to be easily recognised, but not enough to modify labour, since the flexibility of the cranial bones is usually much increased in this disease, owing to their thinness and to the greater

width of the fontanelles and sutures. It sometimes, however, increases the cranial diameters to twice their normal size or more.

Frequency.—In the lying-in charity of Guy's Hospital the increase in size of the head was enough to make operation necessary in only one case in more than 20,000. The actual occurrence of hydrocephalus at birth is given by authors in numbers varying between one in two, and one in three thousand ; but these numbers include a very large majority of instances in which there was no trouble at labour.

Course of Labour.—The presentation is more commonly one of the vertex than any other ; but pelvic lies are commoner in hydrocephalic than in normal fœtuses. The reason is that the enlarged head finds better accommodation at the fundus of the uterus than at the lower end (fig. 362).

Fig. 362.

The degree to which this deformity interferes with the course of labour depends on the size of the head and the amount of ossification present ; and the head may squeeze through the pelvis if these are not excessive.

The great danger in such cases, if assistance is not given, is rupture of the uterus. This is especially liable to happen, because, in addition to the fact that the labour is obstructed by the inability of the head to enter the pelvis, the lower segment is unusually stretched by the large head in a transverse, as well as in a longitudinal direction.

The skull has been known to burst under the pressure of a pain, or in pelvic presentations during traction, and the effused fluid to escape through the anterior fontanelle under the scalp (occipito-frontalis tendon). Labour is then easily completed.

Diagnosis.—When an abdominal examination is made and the vertex is found presenting, the base of the skull is felt to be unusually high above the brim, and of unusually large size. Per vaginam the head, owing to the wide fontanelles and sutures, may be mistaken for the bag of membranes, or for a breech presentation. Most commonly the increased flatness of curve compared to that of a normal head is made out without difficulty. If the presentation be of the breech, the large head is, as a rule, readily made out by abdominal palpation ; but if this is not made out, the fact that the head does not follow the trunk will lead to an examination of the abdomen, and, the head being easily felt above the brim, the condition will be detected.

Prognosis.—This entirely depends on timely diagnosis. If a diagnosis is not made until the effects of prolonged labour have become severe it is bad ; and worse, of course, if rupture of the uterus has occurred.

Treatment.—If there is enough enlargement of the head to completely obstruct labour, the child's life is of no value, owing to the amount of disease of the brain that must be present. In cases where there is not great difficulty in pulling the head through the pelvis with forceps, or it is very important that there should be a living child born, it should be extracted in that way ; but in any case of complete obstruction where the hydrocephalus is well enough marked to be diagnosed, perforation is the right treatment,

whether the child is in a cephalic or a podalic lie. In the former case the child may be extracted with the craniotomy forceps or the cephalotribe (p. 386).

Fluid in other Cavities of the Body

Under this heading are hydrothorax, ascites, distension of the bladder, owing to imperforate urethra, and cystic kidneys.

The bladder may be so enlarged as to contain twenty, thirty, or even a larger number of ounces of fluid. Ascites, hydronephrosis and hydrothorax have been described in the chapter on intra-uterine diseases of the fœtus (p. 263).

Diagnosis.—Some obstruction to labour is found to be present, often after the head has been born, and the condition has to be made out by combined palpation. In cases of abdominal enlargement the abdomen usually presents, and if delivery is able to be accomplished without embryotomy, the child is usually born in a retroflexed attitude.

Treatment.—This consists in perforating the most easily got-at part of the collection of fluid. Such cases are usually born prematurely, and may need little assistance beyond traction.

Fluid in the Connective Tissue. General Œdema.—This is a very rare condition. It has been found in connection with syphilis of the mother and in sporadic cretinism, but there is nothing certain known about its pathology (see p. 268). The treatment is to cut up the child to the degree necessary for extraction. It is always dead.

Tumours.—There are none that cause absolute obstruction, but it is important to remember them for purposes of diagnosis. The commonest are spina bifida and other meningoceles. A spina bifida may be very confusing in a breech presentation if only vaginal examination be relied on. Tumours of the thyroid gland, liver, spleen, and other organs, and included fœtuses, have been recorded as giving rise to obstruction in varying degrees.

3. **Monsters, Single and Double.** *Single Monsters.*—Of these the only ones of obstetric importance are cases of ectopia viscerum and anencephalus. The former is interesting because of the abdominal presentation which is usually found, and because the cord is nearly always absent or very short. In the case of anencephalus (see p. 263), if the lie is cephalic the head will not sufficiently dilate the passages as it comes through them, and the shoulders are arrested. The diagnosis in this case is made by feeling the face, and making out that there is no vault attached to the skull. This deformity is nearly always found in connection with hydramnios.

Double Monsters.—The best classification for practical obstetric purposes is that of Herman :

(1) Those in which only one end of the fœtus is double.

(2) Those in which there are two fœtuses loosely connected.

(3) Those in which there are two fœtuses closely connected.

In the first class of case the end doubled is much larger than normal, and the duplicated parts are fused together, as in double-faced monsters or those with a double pelvis. The diagnosis can only be made with certainty by exploration with the whole hand. If labour has been long in progress

such exploration will probably be dangerous, and in fact is not very important ; for the treatment in the case of double face is to perforate as in hydrocephalus, and that in double pelvis, which will cause obstruction when the head is born, to cut up the pelvis with strong scissors or the sharp hook.

In the second class the union of the two more or less complete fœtuses is also at the head or the pelvis. The freedom of movement possible allows the two unattached extremities to be sufficiently separated from one another to lie at the two opposite ends of the mass. Thus, the heads being united, the breech of one child may be born first and the breech of the other last : or, the two fœtuses being united by the breech, the heads may diverge sufficiently to form the two opposite ends of the descending mass. The children are nearly always premature, and there is little difficulty about the labour.

In the third class the ends which are united are fused closely, and the ununited ends are completely, though not widely, separated. Or two complete children may be united all the way down the trunk by the back or the belly or the side.

In these cases labour may be entirely obstructed at an early stage, or one child may be partly born and the other may come down into the brim and arrest progress. If the children are small they may become adapted to the pelvis after a time, the head of the second fitting into some compressible part of the first, or a kind of Spontaneous Evolution (see p. 470) taking place in the body of the second one.

The *treatment* which has been found most successful, if diagnosis has been made sufficiently early, is that of bringing down the feet of one of the component fœtuses. If this case is not clear, the diagnosis has to be made from impaction of twins (see p. 476), and embryotomy at once proceeded with. The object of clearing up the question of twins is obviously to avoid indiscriminate cutting and mutilation where, as in the case of impacted twins, only one child need be destroyed so as to make possible the delivery of the other alive.

Transverse Lies

Cephalic and podalic lies have been defined as the normal ones ; and the few irregular attitudes of the child while in one or other of these lies have been described in the chapter on Normal Labour.

In the transverse lie the long axis of the fœtal ovoid is at right angles or nearly so to the axis of the parturient canal.

So-called transverse lies are, however, only rarely really transverse, for that would mean that the head and breech were at the same level. In nearly all cases the head is lower than the breech, and the shoulder or its neighbourhood is the presenting part.

Causation.—A full-term child in a transverse lie is in a condition of unstable equilibrium, and there must be some constantly acting cause which keeps it in this lie in opposition to the laws which govern the relations of the long axis of the fœtus and that of the uterus. Such a cause may be something abnormal in the uterine contents causing overstretching as in the

case of hydramnios, or the presence of another fœtus, or the filling up of the lower end of the uterus by a placenta prævia. Or it may be due to some contraction of the pelvic brim which prevents the head from occupying the brim, and thus produces uterine and fœtal obliquity ; or a tumour in the pelvic inlet which pushes the lower pole of the child to one side.

If the fœtus is premature, it may lie in any axis, and this may be a transverse one.

The causes in the order of frequency are :—

Contracted pelvis, usually combined with uterine obliquity.

Prematurity.

Death, or decomposition of the fœtus (absence of muscular tone).

Twin pregnancy, especially with an inert uterus.

Placenta prævia.

Hydramnios.

Tumours in pelvis ; fibroids in the uterine wall ; or cysts or other tumours outside.

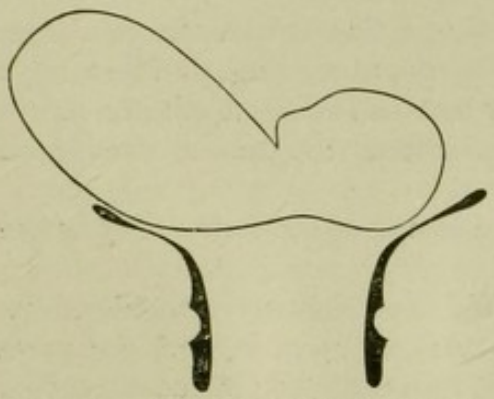

Fig. 363.—Elevation of brim and child.

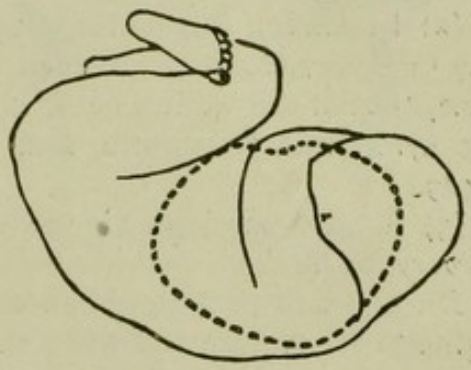

Fig. 364.—Plan of brim and child. The brim is represented by the dotted line.

Positions.—The child may lie with its back to the front, or posteriorly ; it may also have its head either to the right or the left. Thus there are four possible positions, of which one has not more importance than another. In any one of these the child does not lie with its long axis parallel with the transverse axis of the brim, owing to the usual dextro-rotation of the uterus ; but tends to lie on this account with its bisacromial, or some axis near that, parallel with the right oblique diameter of the pelvis, in whichever of the four positions the child is.

Seeing that a transverse lie is developed from a left occipito-anterior vertex in the majority of cases, the back is most commonly forwards, and, owing to the right obliquity of the uterus, the head is in the left iliac fossa. In most instances the head will lie somewhat anterior to the shoulders.

Events in Cases left to Nature.—The prognosis in an unassisted case of transverse lie, unless the child is small or dead, is very unfavourable.

What happens is most commonly as follows. During the first stage of labour the *os dilates slowly*, owing to the elongated shape of the bag of membranes, which is again due to the absence of any part, such as the head, to fill up the lower segment and prevent the full force of the intra-uterine pressure coming on the bag. *The cord often presents* at this stage, and

prolapses when the membranes rupture, also on account of the irregular shape of the presenting part, which allows it to slip past; this is rendered easier by the proximity of the child's belly to the os uteri.

Rupture of the membranes occurs early, before the os is dilated, and the waters drain away rapidly for the same reason as that which allows the cord to come down. The uterus now retracts on the fœtus and placenta. The fœtus, with the shoulder advancing into the pelvis, and the arm usually prolapsing, is driven down into the dilating lower segment, which, together with the upper part of the vagina, is pulled up by the retracting upper segment. In addition to this longitudinal stretching there is considerable transverse tension owing to a longer axis of the child than usual lying across the lower segment. The action of the uterus, responding to the obstacle to advance, becomes more and more energetic, and pains follow one another with increased rapidity. The *uterus now usually* (1) *becomes tetanic* (see Prolonged Labour, p. 407), and the woman has all the symptoms of obstructed labour, and may die from exhaustion, or in the other ways which may result from prolonged labour.

(2) Instead of this ending, *rupture of the vagina* or lower uterine segment may in a very small percentage (about 1 in 60, according to Herman) take place, that of the vagina being commoner because this is a thinner structure. The symptoms of rupture, and the signs which threaten it, are found on p. 489.

(3) A third possibility is the occurrence of one of the forms of *spontaneous delivery*, to be described immediately.

During this prolonged labour the *child* has suffered considerably. It begins to be compressed when the uterus retracts upon it, and the pressure goes on increasing, unless rupture occurs, until delivery is accomplished, or until the uterus ceases to contract owing to the failing life of the mother. The placenta also is compressed until its circulation is arrested. From both these causes death occurs pretty soon.

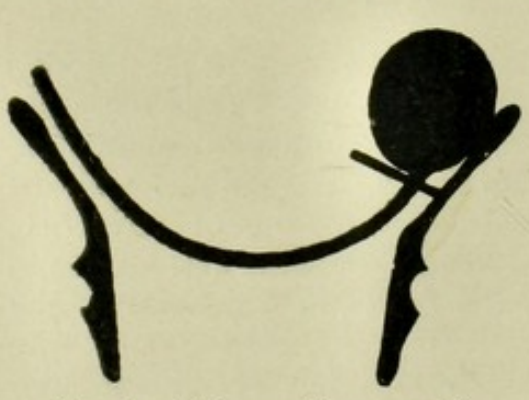

Fig. 365.—Diagram of transverse lie.

Spontaneous delivery in transverse lies is only likely to occur in cases where the child is small, seeing that the commonest cause of the lie is contracted pelvis. The mode varies according as the child is alive or dead. If it is alive, and therefore possesses some muscular tone, the methods possible are: (1) spontaneous rectification; (2) spontaneous version; (3) (rarely) spontaneous evolution.

If the child is dead, it may be expelled by either (1) spontaneous evolution, or by (2) spontaneous expulsion (*Corpore conduplicato*).

Spontaneous Rectification.—This takes place above the brim altogether, and before the membranes are ruptured. It consists in the restoration of the cephalic lie. Its mechanism is as follows: as the head is lying it bulges the part of the uterine wall overlying it beyond the general level of the uterine surface. When the uterus contracts it tends to recover its normal

shape, and to thrust the head towards the centre, thus bringing it more over the brim; the same process is going on at the breech. The fœtus, being alive and possessed of enough tone to keep its axis fairly rigid, is brought into the uterine axis, and into a cephalic lie. Excess of liquor amnii will interfere with this process, for the head and breech are not then pressed on when the uterus contracts, but are protected by the liquor amnii.

This movement corresponds to the operation of cephalic version.

Spontaneous Version.—This process was first described by Denman. It takes place at the brim soon after the waters have begun to escape, and before the uterus has retracted on the child, and where the child is alive and its spine has some tone and resiliency. On account of its lie the child does not descend into the pelvis, but the shoulder does to a small distance, being forced down by the pressure of the uterus on the breech, and the arm may even have prolapsed. The pressure on the breech tends to push the trunk across the pelvis in the direction of the head, which lies in the opposite iliac fossa, the elastic spinal column transmitting the force, and changing its direction along the curve formed by the flexion of the spine with its convexity downwards (fig. 366). As the uterus goes on contracting the breech gets lower and lower, and the lower of the two hips is forced down into the brim, followed by the whole breech (figs. 367, 368). When this has happened, and the child's pelvis is below the sacral promontory, it rotates into the hollow of the sacrum, for there is more space there. The head, which has been rising slightly, but not in any degree corresponding to the descent of the

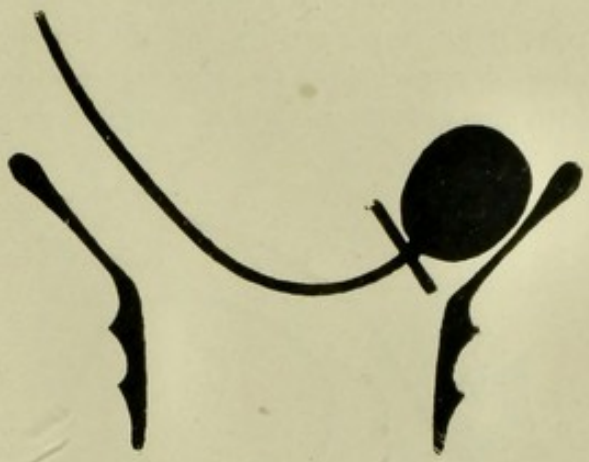

Fig. 366.—Spontaneous version

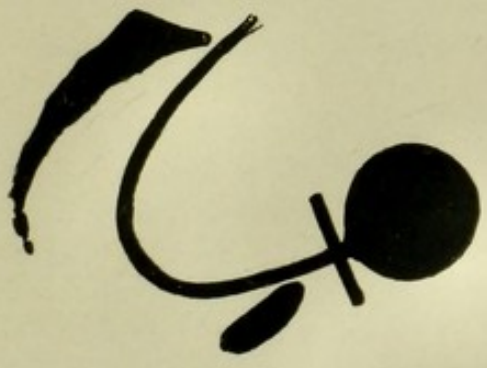

Fig. 367.—Spontaneous version.

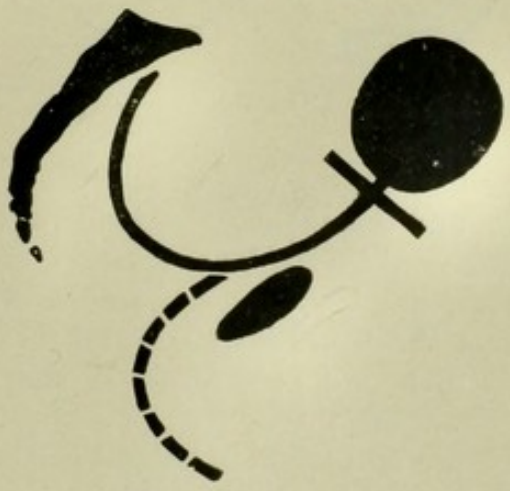

Fig. 368.—Spontaneous version.

pelvic end, comes to the front (towards which, it will be remembered, it had an inclination, the trunk lying in the oblique diameter), and the shoulder may be raised slightly out of the brim. The child now lies almost in the antero-posterior diameter of the pelvis, and its trunk descends, revolving

round the pubes as an axis, the flexion of the spine being now reversed, and being concave downwards (fig. 368, dotted line). The child is then born as it would have been if the breech had presented originally.

This process corresponds to the operation of Podalic Version.

Spontaneous Evolution.[1]—This mechanism takes place mainly in the cavity and outlet of the pelvis. The child is practically always dead or premature, though cases are on record where a child at term has been born in this way and has survived. The death of the child may occur during the process.

The child lies at first, as in spontaneous version, with its shoulder or some part near it presenting at the brim. As the breech is driven down, the shoulder, owing to the absence of tone in the trunk of the child, descends into the pelvis, instead of tending to glide across the brim. The arm usually

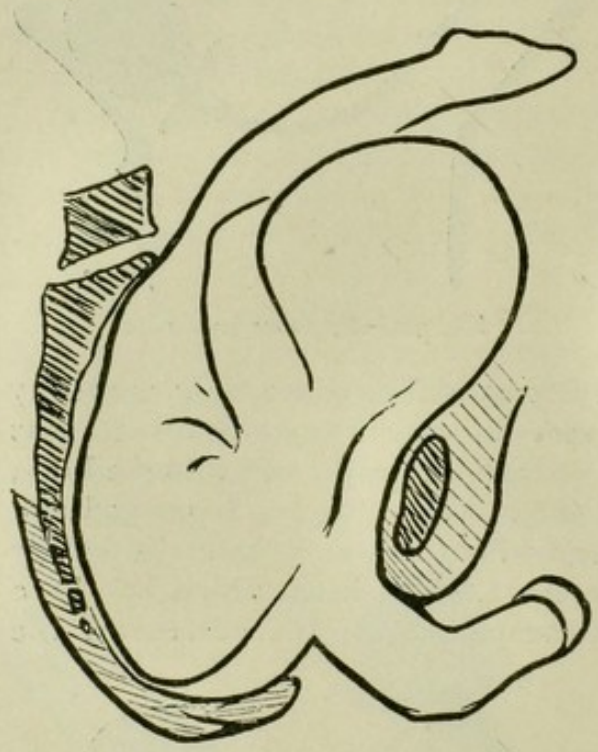

Fig. 369.—Spontaneous evolution.

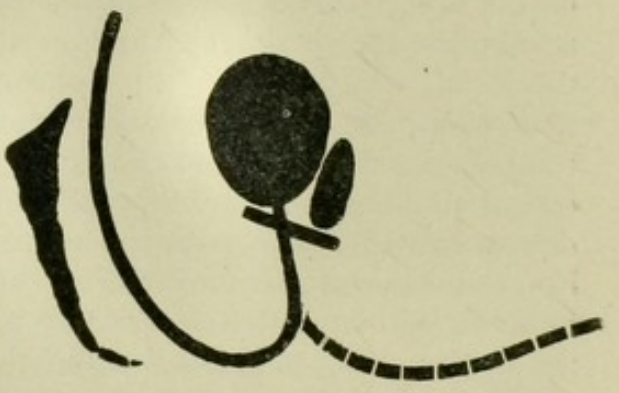

Fig. 370.—Spontaneous evolution.

prolapses into the vagina at this stage. The uterus now drives the breech down, and the shoulder and side of the thorax deeper into the pelvis. These are followed by the breech, which moves backwards into the hollow of the sacrum, the head coming to the front. The side of the neck is jammed against the back of the symphysis, the shoulder coming down under the pubic arch and presenting at the vulva. The thorax now distends the perinæum (figs. 369, 370), and the breech is forced past the head and neck, which are still jammed behind the symphysis, flexion being very acute at the angle formed by the doubling-up of the trunk in this movement.

[1] There has been some confusion as to the meaning of the two terms Version and Evolution in these cases. Denman, when he first described what we call Spontaneous Version, called it Spontaneous Evolution. Soon after, Douglas, of Dublin, described another method of natural delivery in transverse lies, which he called Spontaneous Expulsion, and which we call now Spontaneous Evolution.

The breech clears the space between the head and neck in front, and the pelvic floor behind, and the feet come down (fig. 370, dotted line). The head and posterior shoulder are now all that remain in the vagina, and the case ends as a breech.

Spontaneous Expulsion. Partus corpore conduplicato.—In this method it is essential that the child be dead and premature. The body is then doubled up, the flexion taking place somewhere in the lower dorsal spine. The angle thus formed is born first, and the chest and belly apposed to one another are followed by the head and feet. The head, instead of remaining above the pubes, as in Spontaneous Evolution, comes down alongside the trunk, pressed into the abdomen (fig. 371).

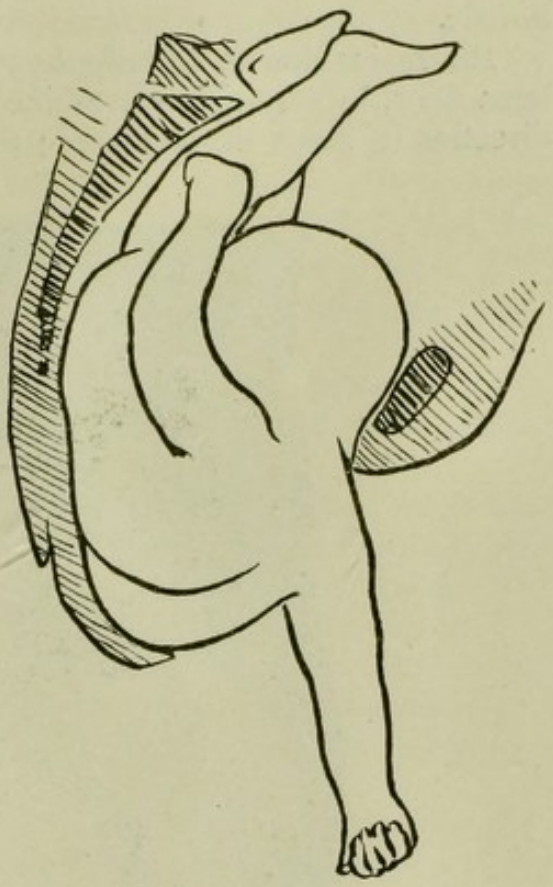

Fig. 371.—Spontaneous expulsion. Birth with body doubled up (*Corpore conduplicato*).

Diagnosis of Transverse Lie.—This is usually fairly easy, for the shape of the uterus as made out from the abdomen is altered, its long diameter being nearly transverse instead of vertical. The head may be felt lying in one iliac fossa, and the breech on the opposite side of the abdomen, but higher at first than the head (fig. 372). The abdominal examination will be less easy if the uterus has become tetanic and the abdominal walls tense, though the shape of the uterus will be then well marked. Before rupture of the membranes the condition may be obscured by excess of liquor amnii. The situation of the fœtal heart-sounds is not of much help.

Per vaginam, the shape of the bag of membranes may be a guide to the abnormality, and it will be found that there is *no presenting part to be made out*, as the trunk does not descend into the pelvis. In case of doubt the whole hand should now be introduced into the vagina, under anæsthesia if the patient is a primipara, and the lower uterine segment thoroughly explored, the operator taking the greatest care not to rupture the membranes. With the external hand on the abdomen the lie of the child can be exactly made out. It is much better, however, to make out the state of affairs by the abdomen, and then there is no need to risk rupture of the membranes, which it is essential to keep intact so as to render as little difficult as possible the treatment which is necessary.

If the membranes have ruptured the shoulder can be made out. This part resembles somewhat the knee in its general outlines, but is distinguished from this and from the breech, or the side of the face by the presence of the

clavicle, the acromion process, and the spine of the scapula, but above all by *the ribs*, which are recognised in the axilla, and are absolutely characteristic.

The arm will be usually prolapsed, or it can be brought down. The elbow may present, and might be confused with the heel, on account of the projection of the olecranon behind the condyles. The two parts are at once distinguished by passing the finger along the bone with which the projection is continuous. The sole of the foot and the toes are characteristic.

It remains now to identify the position of the child if this has not already been done, by external or combined examination. The axilla will show the direction in which the head lies ; the spine of the scapula will show the back

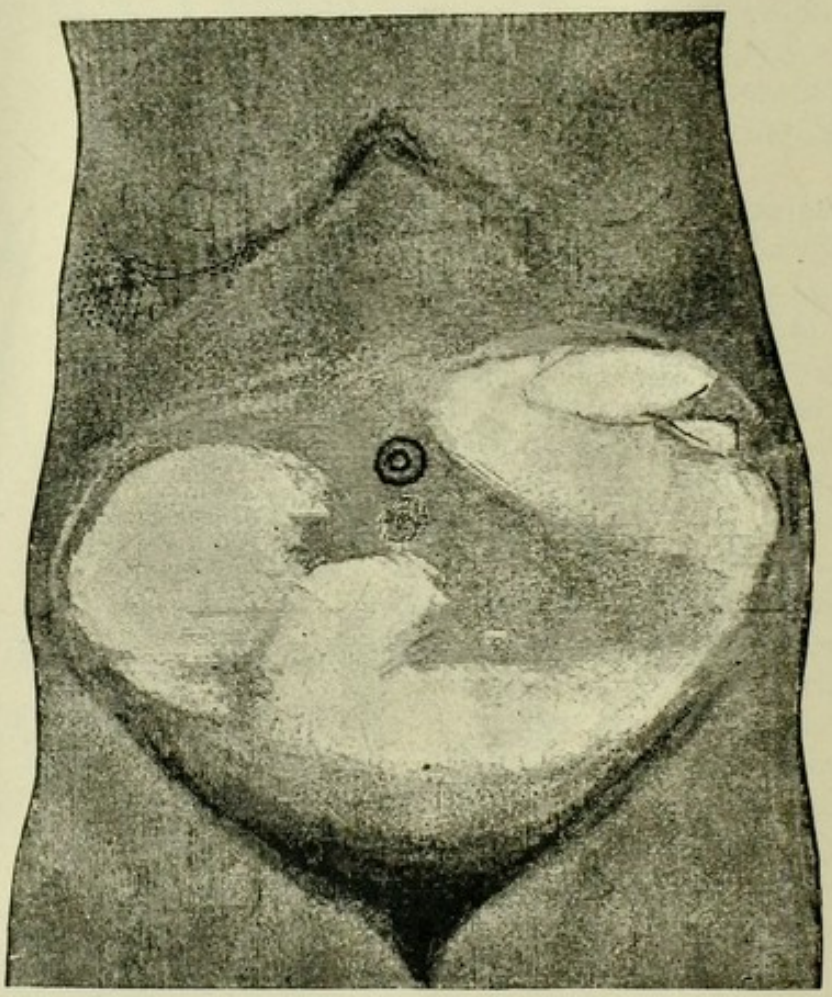

Fig. 372.—Graphic representation of parts which may be felt in a transverse lie, the head being to the right and the back forwards. (The head is rather higher than usual.

and the clavicle the front of the child. If the arm is down it should be supinated (thumb carried towards dorsum of hand), and then the thumb will point to the head, and the palmar surface of the hand will correspond to the anterior surface of the child. If the child's hand is grasped in the right hand of the operator as in the act of shaking hands it will be found which hand is prolapsed.

Early diagnosis is of the greatest importance, for the result entirely depends on this.

Treatment.—This varies according to the stage at which the case is first seen ; the amount of dilation of the os ; whether the membranes are still intact or not ; the state of the uterus ; whether the child is living or dead ; and whether the pelvis is contracted or normal.

If the child is alive the condition of the uterus is the main guide. While this is still loose on the child, an attempt may be made at cephalic version (p. 366) by the external method, (*a*) *if the membranes are intact* and the os still small ; if this is not possible, bi-polar cephalic version should be tried, the os being allowed to dilate, or dilated artificially if necessary. This is, of course, supposing the pelvis is normal or nearly so, since with a brim which would not allow of head-first delivery it would be waste of time. During the attempt the woman must lie on the side to which the head is directed, so that gravity may help the breech to fall over. A binder with a large pad over the head should be adjusted. If this does not succeed, and the brim is not too small to allow of the passage of the child's head after version, turning by the feet must be practised, best by the bi-polar method : but by the internal method if that is impracticable.

In these two operations an attempt is made to follow the natural method of delivery in transverse lies, cephalic version imitating spontaneous rectification, and podalic version imitating spontaneous version.

(*b*) *If when the case is seen the membranes have just ruptured* and the uterus is still not gripping the child, podalic version should at once be performed, supposing the os is dilated enough for delivery. If it is not, it should first be dilated with hydrostatic dilators, and then the child should be turned.

(*c*) *If the uterus is in a state of tetanus* it is most dangerous to attempt to turn, for rupture of the uterus may be caused by the hand of the operator, or possibly by parts of the fœtus. In such a case as this the only procedure is to *decapitate* the child, which will probably be dead.

(*d*) *If the child is dead*, which will be in most instances only after the membranes have ruptured, it should be decapitated. If it is dead from any cause before the membranes are ruptured, it is best to turn if this can be easily done ; if, however, there is any difficulty in turning, no risk should be incurred for the mother by continued attempts, but decapitation must be performed. If when the case is first seen one of the processes of spontaneous delivery is already in progress, it should be helped ; but on no account is anything of this kind to be waited for when once the lie has been recognised.

These directions may be epitomised. The pelvis is supposed to be large enough to allow the head to pass, and the child in the first three cases is supposed to be alive.

1. Os not large enough for bipolar version. Try to place the head over the os and keep it there.

2. Membranes unruptured, os moderately or fully dilated. Do bi-polar version ; if cephalic version is unsuccessful bring down a leg.

3. Membranes just ruptured. If the os is not enough dilated, dilate it, and bring down a leg.

4. If uterus tight on child. Decapitate.

Abnormal Attitudes

Many abnormal attitudes have been already considered, such as brow-presentations (neither flexion nor extension); knee and footling cases; extension of legs on trunk (*siège décompléte*); prolapse of arm (in transverse lies). There remain flexion of the lumbar spine producing impaction of the breech; prolapse of arm in front of or with the head, and dorsal displacement of arm; descent of the foot or the feet with the head; of the arms and feet together.

Impaction of the Breech.—Arrest and impaction in breech cases are more often due to the flexion of the lumbar spine which is found with extension of the legs than to large size of the child (p. 463), or to local enlargements. It may also be due to unusual rigidity of the fœtal trunk.

The first and last named conditions prevent the child from accommodating itself to the curves of the parturient canal; and the first named causes the lower end of the fœtus to assume the form of a blunt wedge (fig. 373). In the author's experience the *siège décompléte* brings about impaction almost exclusively when the child is in a sacro-posterior position.

Treatment.—Traction may be made on the breech by hooking a forefinger over that groin of the child which lies anterior; then when the body has been brought down, if it will move, one or two fingers may be hooked into the posterior groin.

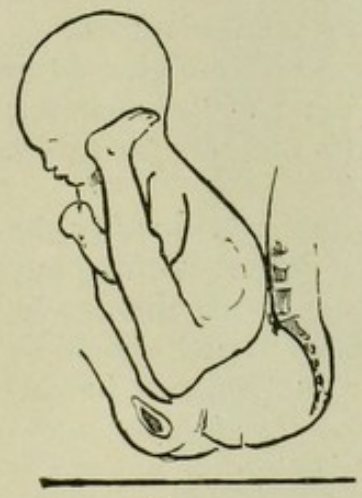

Fig. 373.

If this method is unsuccessful *one leg should be brought down*, and it will be found easier to bring down the one which lies anterior.

When this is accomplished the lumbar flexion (fig. 373) is rectified, and labour proceeds without difficulty.

It may not be easy to get down one of the legs when they are extended, because the foot is out of reach, and the fingers may have to be passed up to the fundus. If, however, the tips of the fingers are passed up as high as the knee, and this is pushed towards the anterior aspect of the child, the hamstring muscles, being already overstretched, will cause flexion of the knee, and the foot may come down nearly as low as the fingers. It is at all events easily reached.

The blunt hook (p. 386) is of service in some cases, but it is best reserved for dead children, since it may do harm to the structures in or near the groin over which it is applied.

A handkerchief, or better, for it can more readily be made aseptic, a *length of rubber tubing*, may be passed over the groins, or round the pelvis and between the legs of the child, and used as a tractor in similar cases.

But this and the blunt hook are inferior to the method of breaking up the presentation by bringing down a leg.

The forceps is useless.

Prolapse of Arm with Head.—It is not infrequent to feel through the anterior fornix that the fingers are in the lower part of the uterus just before labour; but if they are found after the os has pretty well dilated, the hand may prolapse when the membranes rupture. It is, however, very often pushed out of the way by the advancing head.

Prolapse of the arm during labour means that there is a space between the wall or the lower uterine segment and the head, or a potential space between the side of the pelvis and the head. This may be due to contraction of the brim, or to excess of liquor amnii. Death of the child and the consequent flaccidity of its limbs will contribute also. The arm may be felt before the membranes rupture, or may come down afterwards. (Compare presentation, prolapse, and expression of the cord, p. 514.)

Course of Labour.—Labour may go on normally if there is plenty of room and if the prolapsed arm lies in a posterior quarter of the brim; but even when it is here the mechanism may be interfered with, and over-rotation of the head or of the shoulders may occur, on account of the arm impinging on the pelvic floor.

If the arm descends in front of the head it takes up a good deal of the available space, and even if it does not, as it may, prevent the head from engaging, it causes considerable delay or even arrest of the child, with damage to the arm. In contracted brim it causes a space to be left between the head and the brim through which the cord may prolapse.

Diagnosis.—It is well to make out to which side the arm belongs, as this knowledge will be of some use when attempts are made to replace it. The pelvis must be examined for contraction.

Treatment.—If the pelvis is contracted, and the uterus lies obliquely, the woman must be placed on her side with the prolapsed arm uppermost, so that gravity may help to rectify the obliquity. If this is not effectual the arm must be pushed up above the head, the woman lying in the same position. If the hand cannot be reduced or comes down again, and the head does not descend during the pains, bi-polar version must be attempted. It this does not succeed, dilation of the os may be waited for, or artificial dilatation proceeded with, and then internal version performed. If when the patient is first seen the head and arm are in the pelvis, the case may be watched for a time to see if labour progresses. If there is long delay the forceps must be used, care being taken not to include the arm within the blades.

Dorsal Displacement of the Arm.—This is very rare. The arm lies behind the back of the child's neck. It probably passes without discovery in most cases. It may be suspected if the head does not descend, there being no other reason discoverable for delay. It may be possible to make out the arm through the abdominal wall; but if this cannot be done, the hand must be introduced into the vagina, and the head examined bimanually. The cervix will always be well dilated before there can be any result from the abnormality.

The best treatment is probably to turn at once, by the bi-polar method if possible. The other ways are to pull down the arm and to treat the case as one of prolapsed arm, with the forceps if possible; or to rotate the head

as it lies above the brim with the hand in the vagina in the direction of the child's fingers, in the hope that the arm may become unwound from the neck.

Prolapse of Foot or Feet with Arm or Arms, or with the Head.—The foot or feet may be part of a pelvic lie (p. 168), or may, especially after unsuccessful attempts at turning, be part of a transverse lie. In this last case the arms are not unusually prolapsed also, and perhaps the cord.

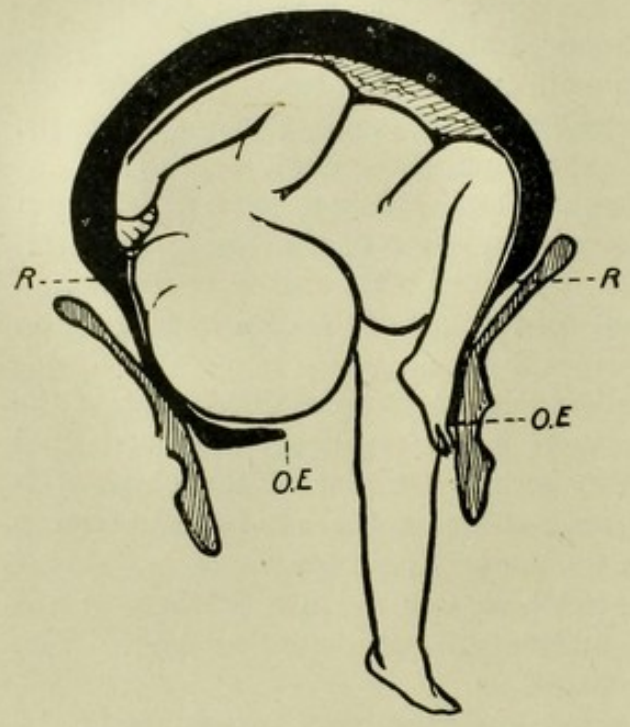

Fig. 374.—*R*, retraction ring ; *O E*, external os. The head is prevented from rising by the retraction ring.

The child is most commonly premature or dead, and owing to this fact the abnormality is not as a rule of very serious importance. It is of importance, however, in cases due to incomplete turning where the child has become extended ; or in contracted brim. The uterus may retract considerably, and the retraction ring may, if the head is in the lower segment, prevent its rising.

Treatment.—The head is to be pushed up, as in a bi-polar version, and the blunt hook (p. 386) used to bring down the leg that remains in the uterus, if one does remain ; or a tape may be tied to one or both legs, as is most practicable, to keep the pelvic end of the child down.

In the case which the diagram represents, the writer had to put on the cephalotribe to the breech before the least movement could be made.

In cases where the head is low and the body flexed, forceps may be tried, the legs being pushed up at the same time.

Interlocked Twins

In labour with twins as a rule one child is decidedly in front of the other at the moment of the entry of the first into the brim ; but occasionally, owing either to small size of the first head, if both are in the cephalic lie ; or to entry of the head of the second child while the brim is not filled up by the body of the first, which has presented by the breech ; or by the second child lying transversely, some part of the second child engages with the first.

Both are in the Cephalic Lie.—In this case the labour will be obstructed when the first head has reached the pelvic floor or soon after. On investigating the cause of the delay the physician will find that the pains are of normal character, and that the pelvis is of normal measurement, and that the presentation is not one which causes arrest. If the brim of the pelvis is

then examined externally, it will be found that there is a large round body at that level which can be made out to be the head of another child. If twin pregnancy has been already diagnosed, and this ought to have been done, it will be readily understood that the head of the second child has entered the brim with the thorax of the first, and has caused a wedging of the two fœtuses.

Treatment.—The forceps may be tried cautiously, and if the child will not come down, the head of the second is to be pushed up externally. This will not as a rule be difficult, since there is no great impaction.

The First Child may be in the Podalic, the Second in the Cephalic Lie.—The labour will be arrested when the legs of the first child are born. If twins have already been diagnosed there will be no difficulty in making out by vaginal and external examination that the head of the first is still above the brim, but that the pelvis is occupied by the head of the second as well as the body of the first. The locking may take place by the chin or by the occiput of each one hitching on that of the other, or by the side of the head of one lying in the hollow of the neck of the other.

Treatment.—It may be possible, if the heads are small, to pull both through together ; but this is unlikely. It is better to try at once to ease the first child a little upwards, and to push the other head above the brim, then pulling the head of the first well into the pelvic inlet. If this cannot be done pretty soon, the first child will in all probability soon die from pressure on its cord. Remembering that the second child is in no danger, and the dead-lock can only now be loosed by decapitating one or the other, it will readily be seen that the child with its legs born is the one to be sacrificed. The decapitator (p. 393) may be used, or the head may be cut off with a strong pair of scissors. The body is then extracted by pulling on the legs. The head will slip up out of the way of that of the second child. This child can be extracted by the forceps, or labour may be allowed to go on naturally.

One Child may be in a Longitudinal, and the other in a Transverse Lie.—Whether the first child presents by the head or the breech, its neck may get jammed with the shoulder or some other part of the trunk of the second. This condition will become evident on a careful internal and external examination.

Treatment.—If the first child—and that is always the one in the longitudinal lie—is alive, an attempt must be made to push up the second trunk. If this attempt is not successful, which, however, it is more likely to be than in the case of locking of the heads, the first child must be decapitated, and the second extracted after version.

Abnormalities of the Membranes or Cord affecting Labour

Abnormalities of the membranes are comprised in the conditions of too great toughness or too great thinness, and are only of importance as they cause too early or too late rupture of the membranes.

The results of anticipation or delay have been already dwelt upon

in the chapters on Normal Labour, and in other places where these abnormalities occur.

Excess and deficiency of the liquor amnii have been treated of on p. 257.

Abnormalities of the Cord.—An abnormally long cord as a rule does not affect the processes of labour. It is said to be one cause of prolapse of the cord.

A too Short Cord.—If the shortness is sufficient it is easily seen that trouble will be caused at the end of the second stage of labour; and the same result may arise when the cord is coiled round the child so often as to make it practically too short; such results are inversion of the uterus; irregularities in rotation; rupture of the cord; and it is believed that the placenta has been separated.

The most serious of these results is Inversion (see p. 486).

The cord was found experimentally by Matthews Duncan to have a breaking-weight of $8\frac{1}{4}$ lbs. on an average, and since, as Herman points out, the average force employed in delivery is 40 lbs., the cord must break if inversion does not take place, supposing the cord is not long enough to allow the navel to do a little more than clear the vulva. This requires a length of about ten inches.

The *diagnosis* of this cause of obstruction to labour is almost impossible unless the child is presenting by the breech. In cases where the potential length is diminished by coiling round the child this will be discovered when the head is born.

Treatment.—If the arrest of labour is due to coiling, and the difficulty cannot be got over by passing the loop over the child's head or its shoulders (see p. 192), or if the cord is really too short, it must be divided; and then the fœtal end held by the fingers or a clip while the child is rapidly extracted, the forceps being used if necessary.

In case rupture occurs, it is usually close to the umbilicus, since this is the weakest part of the cord. If there is any stump left this can be tied; but if the cord is torn off flush with the abdominal wall the vessels must be under-run as described on p. 518.

CHAPTER LXIV

RETENTION OF PLACENTA. POST-PARTUM HÆMORRHAGE. INVERSION OF THE UTERUS

Retention of the Placenta

Retention of the placenta in the uterus for a longer time than that usually occupied in the third stage of labour may be due to either (1) a failure of the uterus to contract in a normal manner so as to expel the placenta; or (2) to a morbid adhesion of the whole organ, or of parts of it, to the uterine wall.

1. **The absence of effectual efforts to expel the placenta** may be due to (*a*) inertia uteri, (*b*) irregular contraction.

(*a*) *Inertia.*—This will be fully discussed when post-partum hæmorrhage is dealt with. An inertia affecting especially the placental site is described, and forms the first stage of inversion by causing this area to bulge inwards (see p. 486).

(*b*) *Irregular Contraction.*—The polarity of the uterus proper to this period is here irregular, and this condition is brought about by at present unknown causes. The irregularity usually shows itself by the development of a tight contraction of the retraction-ring (see p. 98). This has in former times been described as the contraction at the internal os, or at some zone of the uterus higher up than this. The upper uterine segment is in a state of relaxation.

The shape of the uterus thus produced is compared roughly to that of an hour-glass, for the lower uterine segment may become as large as, or larger, than the upper.

Symptoms.—The delivery of the placenta is delayed, and there is hæmorrhage, which is sometimes fairly smart, especially if much of the placenta is separated; the bleeding will go on until all is separated and the uterus retracts. The amount of blood lost is not so great as in the case of inertia. The uterus may be felt externally to have assumed the shape above described; internally and bimanually, it can be felt at once to have this shape by tracing the cord up as far as the constriction.

Treatment.—If the bleeding is not of any consequence matters may be left for a time, and the uterus will probably expel the placenta after recovering its normal contractility.

If the bleeding is too great to be allowed to go on, the placenta must be removed by passing the hand in the shape of a cone up to the constriction and slowly through it, steadying the uterus from above with the other hand. The placenta should then be peeled off from above or from below, or simply removed if it is already detached. It is most important that *no attempt should be made to remove the placenta until it is completely detached*, since if attempts are made to extract it while there are still adhesions, some portion of it is sure to be left behind. Chloroform may be useful in relaxing the constriction; but it is far better not to use it if possible, for the condition is one of morbid contraction of only a small zone of the uterus, the rest of the body being in a condition of relaxation.

This irregularity of action has been called 'Hour-Glass Contraction,' but Matthews Duncan more accurately calls it 'Hour-Glass Dilatation.'

2. **Morbid Adhesions.**—These are much rarer than they are usually supposed to be, and adhesions are frequently imagined to exist because the medical attendant is unable to get the placenta away. When they are present they are due to some disease of the serotina whereby the ampullary layer has been destroyed either in patches or more extensively.

Symptoms.—The placenta is retained for an abnormally long time, and if there is some separation bleeding takes place in varying degrees according to its amount. If the placenta is totally adherent, a most exceptional state of things, there is of course no bleeding.

In these cases the whole placenta may be retained, or the greater part of it may be torn off and expelled, and the rest left adhering (see rules for the examination of placenta and membranes after labour, p. 196).

In addition to placental adhesions, adhesion of membranes will also cause hæmorrhage unless the uterus is so well contracted and retracted that the mouths of the sinuses are closed. Small pieces of membrane will give rise to trouble—namely, secondary hæmorrhage and septicæmia—in the puerperium ; or later, to subinvolution.

The cause of adhesion of the membranes may be disease, as in the case of the placenta, but it is more often due to unskilled management of the third stage of labour.

Treatment.—If the case is made out to be really one of adhesion of placenta or membranes, or both, the only treatment is to introduce the hand into the uterus to peel them off, observing the rule to completely separate the afterbirth before trying to extract any of it. The cord must never be pulled upon.

N.B.—In all cases in which it is necessary to introduce the hand into the uterus, the strictest antiseptic measures must be taken (see p. 181), and an antiseptic douche should be given before and after, if possible, and after in any case.

Post-Partum Hæmorrhage

This is due to Uterine Atony or Inertia.—Profuse hæmorrhage occasionally arises before the placenta is expelled, as just mentioned ; but the most typical cases of post-partum hæmorrhage, in which the patient may bleed to death in a few minutes, arise after expulsion, and not because there is any of the ovum left behind. The bleeding comes from the large sinuses laid open by the separation of the placenta.

Causation.—Women who have suffered from over-distension of the uterus such as occurs in twin pregnancy, in hydramnios, and after concealed accidental hæmorrhage, are liable to uterine atony. It is very liable to occur in cases of uterine exhaustion (so-called 'secondary inertia,' see p. 412) where the woman's uterus has been emptied in the absence of contractions instead of being allowed to recover its tone by rest ; and in the same way delivery of the placenta in the absence of uterine contractions tends to produce this result. It occurs sometimes where the woman is extremely exhausted ; and fibroids in the uterine wall are occasionally found to interfere with complete perfect retraction. In a lesser degree a distended bladder or rectum may have the same effect. Those medical men who are careful in managing the stages of labour, especially the third, in the way that is now known to be the best (see p. 186 and *sqq.*) never have any really dangerous cases of post-partum hæmorrhage.

Symptoms.—The loss of blood is obvious enough ; and in the worst cases several pints may be poured out in a few minutes, and the woman may die straight away.

The uterus in some cases must have never retracted at all during labour ; at all events it may be found on abdominal examination to be distended to a size equal to that of pregnancy at term, and forms then a loose cyst filled

with blood. When the uterus allows itself to be distended with blood to anything like this size it is obviously very much exhausted, and the outlook is very much worse than when the size is only slightly increased above that usual after expulsion of the placenta. Sometimes even in such bad cases, the uterus suddenly contracts, and the whole contents, amounting possibly to several pints of clotted and fluid blood, are expelled. Collapse of the patient from sudden fall in the abdominal pressure is then not unlikely to occur. After such contraction the uterus may again relax, and fresh hæmorrhage be permitted into its cavity. In less severe cases the uterus may be indistinctly felt, not very much enlarged, and when grasped it may contract. Relaxation may recur in these cases also.

The severe loss of blood rapidly induces fainting, and this may be of advantage if the bleeding can be checked at once. If the hæmorrhage goes on the woman will probably die without becoming again conscious. If the hæmorrhage is not severe enough to at once cause the woman to faint, marked signs of acute anæmia—rapid small pulse tending to disappear, cold sweat, feeling of suffocation, failing sight, and sometimes convulsions, will precede death.

The result in every case depends on how soon the bleeding is arrested rather than on the quantity lost. There is no absolute measure of the amount necessary to cause death, as some women recover after losses which would kill others. Women suffering from mitral incompetence or disease of the aortic valves bear the loss of large quantities of blood especially badly.

The anæmia resulting from this excessive loss is sometimes prolonged through and even beyond the lying-in period ; and sometimes, as mentioned in the chapter on Placenta Prævia, the woman dies after the bleeding has ceased for an hour or more, from shock which is prolonged owing to the want of rallying power caused by the anæmia.

Treatment.—The object to be aimed at is compression of the bleeding vessels at the placental site. This is best accomplished by making the uterus contract, for no clotting in the absence of contraction is of the least use. If the uterus has lost its tone to such an extent that ordinary stimulation, including that applied to its inner surface, will not act, the mouths of the bleeding sinuses must be stopped by an artificial imitation in some measure of the normal mechanism. This is effected by bi-manual compression of the whole uterus, as will be described ; or by introducing some body into the uterine cavity which will at the same time both mechanically compress the face of the placental site and stimulate the uterine muscle.

In following the line of treatment to be now described, the various manœuvres must succeed one another rapidly, and the preparations necessary for those to follow must be made while any one method is being employed.

The various methods employed to arrest the hæmorrhage will first be described, and then a scheme of treatment will be given.

Stimulation of uterus (A) directly (B) indirectly

(A) External Stimulation

The patient should be turned on her back. The uterus is then found and grasped with both hands with the finger-tips turned towards the pubes. It may thus be squeezed and kneaded. This will expel clots and stimulate the uterus, and may be sufficient.

Combined Internal and External Stimulation

The patient may be on her side or her back, but the lateral position is the more convenient. The uterus is then supported from without by the left hand, which compresses it against the vertebral column and down on to the pelvic floor; while the right hand (the hand and arm having been made aseptic) is passed into the body of the uterus as far as the fundus. Clots contained in the uterus can then be cleared out, and the uterine wall compressed and kneaded between the two hands. If the uterus contracts on the internal hand this should be slowly withdrawn, and support should be given for some time by placing the fingers in the posterior vaginal fornix, and then compressing the uterus bimanually (see fig. 375, p. 484).

Hot Water Injection

The best temperature for the water is 118° F. It is possible that a temperature above this may still further paralyse the muscular fibres, and will in any case be hotter than any but the most tolerant patient can endure. It is safest to first of all make the injection into the vagina only, and this will often succeed in arresting the bleeding. If it does not, the nozzle of the delivery tube is to be introduced up to the fundus. According to some experiments made by Milne Marshall on the relative effects of hot and cold water in causing uterine contractions, hot water is a fraction of a second slower than cold in bringing about contraction, but it produces a result which is more complete at the time, and much more permanent. Two or three quarts of hot water may be used, and if successful, but followed by a recurrence of bleeding, the injection may be repeated.

A douche-tin should be employed, for a Higginson's syringe involves the risk of injecting air into the uterus (see Air-embolism, p. 555). Cold water is sometimes employed, but it depresses the patient whether used internally or externally, and its effects, as just mentioned, are not so complete or permanent as those of hot water. There is, however, no harm in passing a small piece of ice into the uterus; but ice should not be used in any quantity, for it will then act like cold water in depressing the patient.

Other substances which have been successfully used to apply to the interior of the uterus are turpentine, vinegar, and lemon juice.

Electricity might or might not, depending on the degree of atony present, cause contraction. An apparatus for generating electricity would be too great an addition to the midwifery bag to be taken to every case; and no doubt those uteri which refuse to contract on stimulation by hot water are not likely to respond to electricity.

Injection of a Solution of an Iron Salt into the Uterus

This method was at one time the last resource in the treatment of post-partum hæmorrhage, and it has doubtless saved many lives. There are, however, so many dangers involved in its use that the method next mentioned is far preferable. Barnes[1] describes the operation in the following words: 'Place the woman on her back. Get an assistant to press firmly with a hand on either side of the uterus, while you inject. You have the Higginson's syringe adapted with an uterine tube eight or nine inches long. Into a deep basin or shallow jug pour a mixture of four ounces of the liquor ferri perchloridi fortior. of the British Pharmacopœia and twelve ounces of water, or dissolve half an ounce of solid perchloride or persulphate of iron in ten ounces of water. The suction-tube of the syringe should reach to the bottom of the vessel. Pump through the delivery-tube two or three times to expel air, and to ensure the filling of the apparatus with the fluid before passing the uterine tube into the uterus. This, guided by the fingers of the left hand in the os uteri, should be passed quite up to the fundus. Then inject slowly and gently. Cease injecting as soon as the effect of the styptic is noted. A few strokes is often enough.'

It is, however, a dangerous method for the following reasons. The solution may pass through the tubes into the peritoneal cavity and set up peritonitis. Thrombosis may extend too far, and involve the pelvic veins and the vena cava; a clot being thus formed which will almost certainly be carried on to the heart, to say nothing of the damage done even if it remain *in situ*. The very tough clot formed in the uterus is tenacious and difficult to expel, and it will not improbably putrefy and cause septic trouble. These dangers are not only bad in themselves, but it will be obvious that, knowing of their existence, a medical man would hesitate before resorting to this method of checking hæmorrhage, and thus much blood would be lost. In fact, a fairly large proportion of cases did actually die on this account, for Galabin mentions that iron injection was used twelve times in 24,000 deliveries in the Guy's Lying-in Charity, and says that, although the bleeding was checked in all cases, five died from the results of the hæmorrhage which had previously occurred.

On these accounts this method has fallen into disuse, since the operation of plugging the uterus will just as certainly arrest the bleeding, and has none of these strikingly dangerous consequences.

Plugging the Uterine Cavity

This operation is described on p. 354. Its advantages are: it is quite simple, and the materials can always be handy. In fact, in a case where the patient was in danger of her life if the bleeding were not at once arrested, there need be no hesitation as to running a small risk in the way of possible sepsis, and tearing up a clean sheet, for instance, into strips, powdering with iodoform if this is available, and using this material without further sterilisation. There is no new danger conveyed to the patient if the proper

[1] *Obstetrical Operations.*

materials are used, and the physician should resort to it at once after manipulations and hot water have failed, and before the woman has reached a dangerous stage of anæmia. After plugging has been properly performed he may feel that she is quite safe.

It has been urged against this method that bleeding has sometimes occurred after the plug was applied, and, further, that air-embolism might be caused by the intra-uterine manipulations; but against these objections it may at once be said that the uterus was in all probability not properly plugged in the cases alluded to, and that there is no more danger of air-embolism in the act of plugging the uterus than in that of manually extracting the placenta, or any other treatment which necessitates the entry of a certain amount of air into the uterus.

It is important to remember that this method is quite distinct from (*a*) that of plugging the vagina, which in the case of post-partum hæmorrhage would be useless and dangerous; and from (*b*) the use of intra-uterine tampons soaked in some styptic.

Direct Bimanual Compression of the Bleeding Surface

The uterus may, in the intervals of applying the remedies above described, be compressed bimanually as follows. The hand is introduced into the vagina, and the tips of the fingers advanced into the posterior cul-de-sac, or at least into the part of the vagina behind and below the cervix. The left hand must then find the fundus through the abdominal wall, and press it down on the hand in the vagina. The uterus can thus be firmly compressed, and may be held in this grip for an indefinite time. It is not always easy to find the fundus, however, when it is completely relaxed, but in most cases this way of compressing the uterus will be found very effectual.

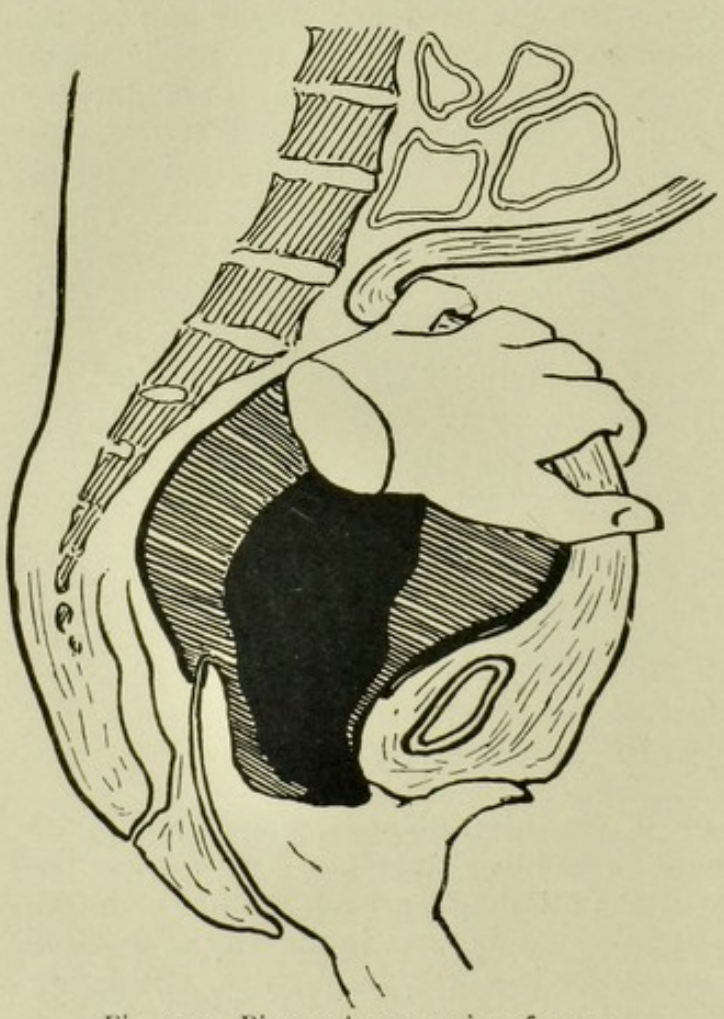

Fig. 375.—Bimanual compression of uterus.

(**B**) There are three other methods of treatment usually alluded to in works on midwifery—namely, the administration of ergot, the application of the child to the breast, and compression of the abdominal aorta.

Ergot, whether administered by the mouth or hypodermically, does not act quickly enough in severe cases to be of any use in an emergency, but it

will tend to help the uterus retain its tone when that has been recovered ; it has no effect on a completely atonic uterus.

The application of the child to the breast is an awkward means in any case, and will certainly not be of use in an urgent case, though it no doubt stimulates the uterus under ordinary circumstances.

Compression of the abdominal aorta will arrest the blood-flow into the uterine veins, and will diminish the loss to that extent ; but it will not prevent the reflux of blood from the pelvic veins into the uterine sinuses, and it will, moreover, deprive the uterus of the arterialised blood necessary to the recovery of its muscle. In cases where the bleeding has to be arrested by any manual efforts for a short time, bimanual compression is by far the best way of doing this.

Scheme of Treatment of a Severe Case of Post-partum Hæmorrhage

If the placenta is retained, remove it. If expression fails, introduce the hand, rendered aseptic, and extract it, peeling it off the uterine wall if necessary. If now the bleeding still continues, or if the case to start with is one where the bleeding begins after the placenta has come away, order several quarts of boiling water to be made ready so as to prepare a douche of the temperature of about 118° F., or as hot as the hand can bear it. Pass a catheter if there is time ; then—

(1) Compress and knead the uterus through the abdominal walls.

(2) Keep up the pressure by one hand externally, passing the other up to the fundus, clear out all clots, and compress the uterine wall between the hands.

(3) With the internal hand in the posterior cul-de-sac of the vagina, compress the uterus bimanually.

(4) Give a vaginal douche of the hot water (two quarts), and if this does not cause some contraction after a pint or so has run, pass the tube up to the fundus ; or if the bleeding is very severe, pass it up to the fundus at once.

(5) Plug the uterus.

This is the order in which the various methods are best used, the operator passing from one to the other at once as he finds he is not succeeding in checking the bleeding, and holding the uterus bimanually at any time while the materials necessary for the next manœuvre are being prepared.

After-treatment.—The woman will of course be very bloodless after a severe attack of post-partum hæmorrhage ; and although the bleeding may have been arrested before she dies, she may still become syncopic and be lost. She should be placed flat on her back, with her head low, and the foot of the bed raised on blocks of some kind.

If her pulse is very bad, that is, rapid (160 or more) and hardly perceptible, some means of keeping the heart supplied with blood or fluid of an inert kind must be adopted.

The simplest way is by the process of auto-transfusion ; namely, bandaging the legs and arms tightly, so as to make the circuit of the blood as short as possible. The blood may be forced out of the abdominal veins, in which, owing to the relaxed condition of the abdominal walls and the

reduction of the abdominal pressure by the emptying of the uterus, it tends to collect, by stuffing a pillow into the abdomen and bandaging it on. At the same time a pint or two of warm water or saline fluid may be slowly injected into the rectum ; it is quickly absorbed from there.

If, however, the patient's condition is at all alarming or even unsatisfactory, there is no doubt that the best procedure is the infusion of saline fluid into one of the veins. The mode of action of this remedy and its method of performance are described on p. 360. Münchmeyer used a trocar which he passed into the connective tissue and muscles of the back, and through this he injected saline fluid. He found it useful in many cases, and it is a simple method of adding fluid to the blood-mass. It is, however, slow, and if the woman is really in a dangerous state, too slow to be of any use.

If the woman survive the blood-loss she should be carefully dieted, and fed in small quantities and often with easily digestible food. The greatest possible care must be taken to avoid any risk of sepsis, for after acute and large hæmorrhage women are peculiarly liable to septic absorption (see p. 526).

Secondary Post-Partum Hæmorrhage

This name is given to bleedings either in excess of the normal amount during the time when there is still blood in the lochia, or occurring later during the involution of the uterus at a time when no blood should be lost at all. The bleeding depends on deficient uterine retraction, and if at all severe is practically always due to retention of part of the placenta or membranes. The subject is dealt with at the end of the chapters on the Pathology of the Puerperium, under the heading of Abnormalities of the Lochia (p. 576).

Inversion of the Uterus

The uterus is turned inside out more or less completely, not turned upside down only, as the term might suggest. The anatomical change is a severe one if the inversion is complete, for as the fundus descends into the cavity formed by the peritoneal surface of the uterus, the tubes and ovaries are dragged down with it, and may be entirely contained in the cup (fig. 377). The ovarian vessels are strangulated in degree corresponding to the

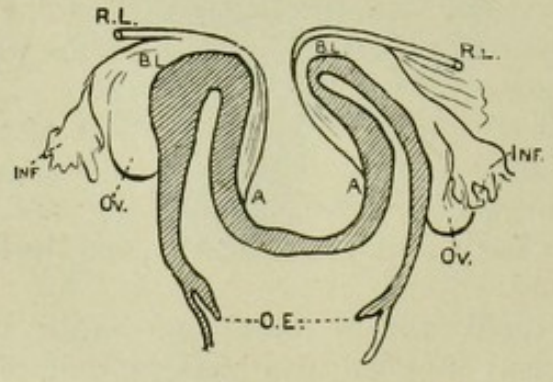

Fig. 376.—Inversion of uterus. *R L*, round ligament ; *B L*, broad ligament ; *Inf*, Infundibulum ; *Ov*, ovary ; *A A*, cornua ; *O E*, os externum.

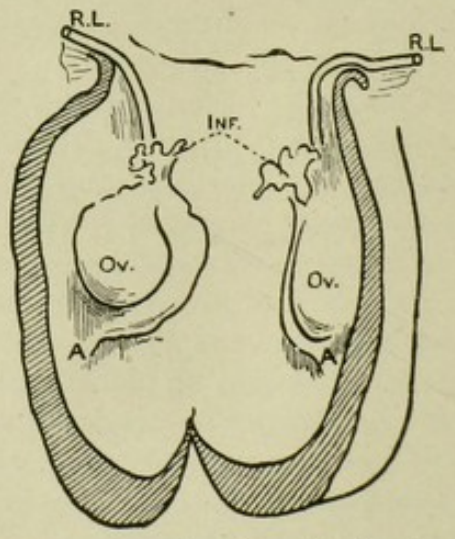

Fig. 377.—Complete inversion, showing relations of ovaries and tubes (lettering as in last figure).

amount of inversion, and in complete cases the uterine vessels are also compressed.

Inversion may be partial or complete ; and the vagina may in its turn become part of the inversion, and form part of a large mass protruding from the vulva.

Frequency and Causation.—It is a very rare accident, and is computed to occur only about once in every 200,000 labours.

To produce it there must be two factors ; relaxation of the uterus on the one hand, and some force, acting from above or from below, which causes the fundus to descend towards and then through the cervix.

If atony of the placental site as a special area ever exists, it is easy to understand how this area might bulge into the uterine cavity, and when this has happened how the amount of the uterine wall thus inverted might be increased by the increased intra-abdominal pressure produced by bearing-down efforts ; or if the rest of the uterine walls had some tone, the placental site being the only part relaxed (fig. 133, p. 121, shows the comparative thinness of the uterine wall at the placental site) the inverted part would be gripped when enough of it had fallen inside the cavity to be gripped, and then expelled in the same way as the placenta itself by the contractions of the zones originally below the descending part but now above it. Small amounts of bulging would be at once reduced by the contracting uterus.

Fibroids in the uterine wall sometimes cause inversion, this being due partly to the absence of contractile wall in their site, and partly to their actual weight.

Inversion may occur before or after the birth of the placenta.

The force acting from above is almost certain to be the hand of the attendant which is applied over a small area of a relaxed uterus ; inversion can only be produced by abdominal contractions after a bulge inwards has been already started.

A force acting from below is most likely a more frequent cause. This may be due in very rare cases to a short cord, and then the inversion must at all events be begun during the second stage. Or at the same period the cord may be found several times round the child's neck, thus producing virtual shortening. Pulling on the cord to extract the placenta has no doubt been responsible for a certain number of instances of the accident.

Inversion during the puerperium has very rarely been noticed ; it must have begun during labour, and the expulsion completed during the contractions and retraction going on in the lying-in period.

Symptoms.—These are collapse and hæmorrhage. The *collapse* is no doubt due to the strangulation of the uterus and its appendages. Diminution of abdominal pressure, which is assigned by some authors as the cause, can have but small effect in its production.

The *hæmorrhage* is, of course, due to the relaxation of the uterus, and is intensified by the greater effect of strangulation on the veins than on the arteries. These two symptoms vary in degree according to the amount of inversion.

Signs and Diagnosis.—When an inversion is complete, with or without vaginal participation, and especially if the placenta is attached, there should

be no difficulty in recognising what has happened. If the placenta is not attached a tumour is found in the vagina, or is occasionally even seen at the vulva or projecting outside, which has to be distinguished from a *fibroid polypus*. To exclude this the fundus must be felt for per abdomen ; if it is absent from its proper place a circular rim, the angle formed by recession of the fundus, may be made out in the brim of the pelvis, an impulse on which is transmitted to the mass in the vagina. It must be ascertained that the uterus is not relaxed and thus missed on examination, as might be the case when post-partum hæmorrhage is going on.

There may be inversion and a tumour as well, and this must be made out by a careful examination of the outline of the uterus per abdomen.

Inversion has been mistaken for the head of a second child.

If only a small part of the uterine wall is affected, the condition will in all probability be recognisable on abdominal examination only.

Results.—Death is rather frequent in cases of the complete degree, and has taken place from shock and hæmorrhage in about 75 per cent. of the recorded fatal cases in a few hours ; and in the remainder later from continued shock and hæmorrhage, and from inflammation and sloughing. Afterwards, in the survivors, involution will go on to a certain extent, and the inversion becomes chronic, causing somewhat the same symptoms as a fibroid polypus.

Prophylaxis and Treatment.—This accident can be prevented by avoiding any traction on the cord, and by keeping the cord under observation if there are any signs of its being short or coiling round the child's neck to a sufficient degree to drag on the placental site. Care must also be taken during the third stage of labour not to press on the fundus during relaxation so as to indent its surface.

When inversion is an accomplished fact the only treatment is to reduce it as speedily as possible. No time should be wasted in attempts to restore the woman, as she cannot be restored until the uterus is reduced. If the placenta is attached, it should be removed, as reduction will probably be easier after this has been done ; but no long time should be occupied in this ; it is not of great importance whether the placenta is attached or not, but it is of the greatest importance to reduce the uterus as soon as possible.

To effect reduction the left hand must be placed on the abdomen to steady the rim, if this is felt ; then the fundus is to be pressed up by the fist in the vagina if the mass is small. If it is large, it appears better to restore the uterus by grasping the fundus in the palm of the hand, and pushing up the re-entering angle, so that reduction advances at the rim, as in this way the four thicknesses of uterine wall which would be produced by bulging the mass inwards from the fundus first are avoided. An anæsthetic is often necessary in these cases ; but if there is no delay in the attempt, reduction may be effected without one.

CHAPTER LXV

LACERATIONS OF THE GENITAL TRACT

THE uterus, vagina, and perinæum may any of them be torn during the progress of labour. Some of the tears are comparatively unimportant—such are the slight lacerations, which are the rule rather than the exception, of the fourchette in primiparæ ; while others, like rupture of the uterus, are very frequently fatal, and in any case are among the most dangerous accidents which can happen to the parturient woman.

LACERATIONS OF THE UTERUS. RUPTURE OF THE UTERUS

Rupture may affect the body or the cervix of the uterus, or both. In describing these lacerations it will be assumed, as described on p. 98, that the lower uterine segment is a part of the body, and that the retraction ring is not, except perhaps at the beginning of labour, at the same level as the internal os.

Rupture of the Body of the Uterus.—This may be complete, involving both muscular and peritoneal coats ; or incomplete, affecting only one of them, so that there is no communication between the peritoneal and the uterine cavities.

Frequency and Causation.—Rupture of the body is found to occur about once in 3,000 labours.

There are said to be predisposing causes of the nature of previous degeneration of the uterine walls, but such changes have not been demonstrated. They have been supposed to exist so as to account for a few rare cases where rupture has taken place during pregnancy or during an easy labour. The cicatrix of a Cæsarian section might be expected to give way under a great strain, and the want of the assistance of the abdominal muscles in the second stage of labour will allow of more ready tearing ; but these are only conjectural predisposing causes.

The immediate causes are undoubted. The most important group by far is that comprising cases of obstructed and prolonged labour. The obstruction may be due to contraction of the bony pelvis or of the soft parts (cervix and vagina), to a too large head for the pelvis where the latter is normal, as in the case of a hydrocephalic head, or to transverse presentation of the child.

Such causes are intensified by misapplied treatment—namely, by attempts at internal version when the uterus is already over-retracted or tetanic, or by the administration of ergot in cases of obstruction.

When the head nips the cervix, as has been explained in the description of labour in the contracted pelvis (see p. 428), the cervix is not able to rise and be withdrawn from the head, especially if the membranes have

ruptured prematurely. Thus the lower segment is excessively thinned and may be lacerated.

In the case of Pendulous Belly, where the anteversion of the uterus causes the expelling force to be directed against the promontory, the part of the uterus lying between the head and the promontory is crushed, and a hole is made.

Whether the rupture is due to tearing or to crushing, the tear is always in the lower uterine segment according to the definition given on p. 98.

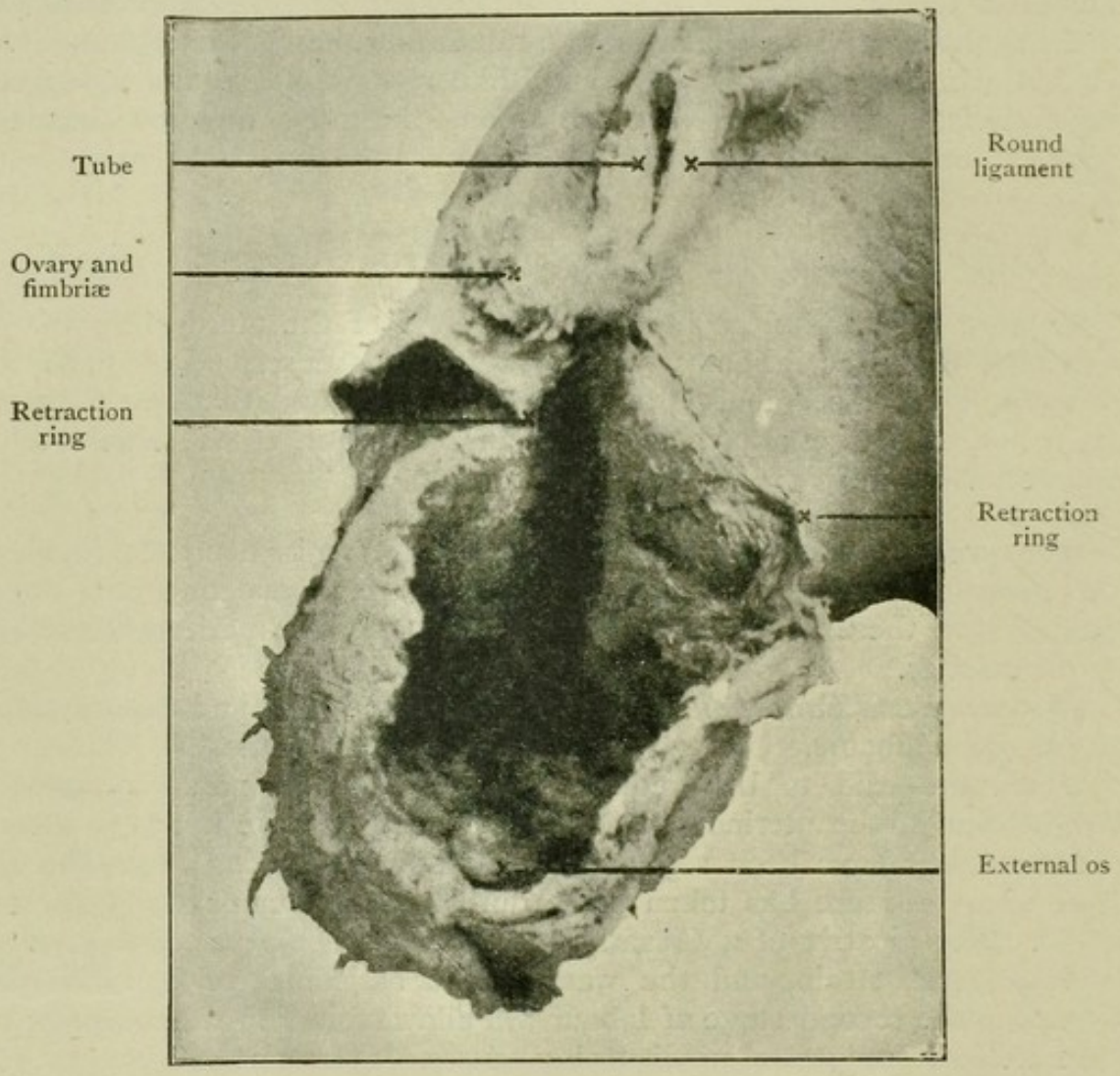

Fig. 378.—Laceration of vagina, cervix, and lower uterine segment into the right broad ligament and abdominal cavity.

Other and accidental causes are perforations by instruments in attempts at criminal abortion, or in unskilful embryotomies of one kind or another; wounds from the horns of cattle; or crushings or perforations, from the woman being run over, for instance.

Morbid Anatomy.—A tear beginning in the thinned lower segment may extend transversely or parallel with the axis of the uterus, depending on the direction of the line of greatest tension, to which the line of tear is always roughly at a right angle. Thus if the rupture is due to nipping of the cervix, the line of tension is longitudinal, and the tear will be across the lower end

of the uterus; but if it is due to radial stretching, as by a hydrocephalic head, the tear is through the rings of unyielding tissue, and therefore longitudinal. It often has an oblique direction, and is very irregular and jagged. The laceration may extend into the vagina, or further up into the uterine body, or it may run round the lower segment and separate the cervix from the uterine body.

The posterior wall is the one which is most commonly completely ruptured, owing to the attachment of this to the posterior valve of the pelvis (see fig. 131, p. 118), and to the fact that the peritoneum extends lower here than elsewhere. Rupture is commoner on the left side than the right, owing to the usual uterine obliquity, and, as Spiegelberg points out, to the fact that in transverse lies the head is most commonly to the left. In cases of lateral rupture the peritoneum is not so commonly perforated, for its lateral attachment is loose, and the layers of the broad ligament are somewhat separated close to the uterus by the growth of the latter in pregnancy.

After a fairly large rupture and escape of the uterine contents the upper part of the organ contracts down to a firm mass, and is usually displaced by the body of the child which lies in the abdominal cavity.

In case of complete rupture the bleeding takes place into the peritoneum and into the vagina. In cases where the peritoneum is not torn a hæmatoma will form beneath it, and the broad ligament of the side on which the tear has occurred will become distended with blood.

If the tear is complete the fœtus may at once be expelled into the abdominal cavity, and be followed by the placenta. Or only the trunk of the child may escape, especially if the head be impacted in the pelvis.

The placenta may be left in the uterus, and may be delivered by the vagina; and a case of Matthews Duncan's is recorded by Spiegelberg in which after rupture had occurred during the birth of the first twin the second was born naturally.

Symptoms.—In the most common kind of case, that due to obstruction, the symptoms which indicate a probable rupture are increased rapidity in succession of the pains and increased violence. On examination of the abdomen the ring of Bandl, already described, may be felt somewhere near the navel, often running obliquely across the belly; and under certain circumstances it may even be visible. At the moment of rupture, if this is complete, the woman becomes suddenly collapsed, the pains cease, and there is a greater or less hæmorrhage from the vagina. On making a vaginal examination the physician finds that the presenting part, if not well engaged in the cavity of the pelvis, recedes; if it is engaged it can be pushed back, unless it is impacted. By the abdomen the child may, if any considerable part of it has escaped, be felt distinctly under the abdominal wall; and probably the retracted and contracted uterus is found beside it. The placenta may then be born, or it may too have been expelled into the abdomen. If it is born, its emergence before the child should at once suggest a rupture of the uterus, supposing this has been hitherto unsuspected. A coil of intestine may prolapse into the vagina.

The woman is in a collapsed condition, with a small, quick, irregular pulse and cold extremities; and death may speedily result from shock, or, more rarely, a little later from hæmorrhage into the abdomen. If she sur-

vive these risks she may die in a day or two from peritonitis caused by infection carried by the lochia and the secretions of the wound into the peritoneal cavity. The total mortality is recorded as about 90 per cent. In very rare cases the child has been encapsuled and the woman thus saved for a time. The child dies almost immediately after expulsion into the abdomen.

The symptoms of incomplete rupture are not well marked. There is some collapse, depending on the amount of tissue torn, and a variable amount of bleeding. The blood may not be able to pass the child's head, and may collect in the uterus. If the rupture has been an extensive lateral one there may be recession of the fœtus when it is not impacted ; but the pains do not cease in cases of a lesser degree, and beyond the shock there may be little to suggest a rupture until there has been a fair amount of bleeding. Emphysema of the anterior abdominal wall may occur in case air is admitted into the subperitoneal tissue through the rent. There may be a mass consisting of the extravasated blood, and possibly the child, to be felt in the broad ligament, and the uterus may be felt alongside this.

The diagnosis of complete rupture cannot be difficult if the important symptoms and signs above mentioned are observed. In the incomplete variety the case might possibly be mistaken for accidental hæmorrhage, or for placenta prævia if the placenta were expelled before the child ; but the existence of obstructed labour will at once distinguish the condition.

Prophylaxis and Treatment.—Rupture of the uterus is almost invariably due to want of attention on the part of the medical attendant, if he has had an opportunity of watching the course of labour from the beginning. The way to avoid it is to take such measures as will prevent the uterus from getting into the condition of over-retraction ; by noticing the relations of the child to the pelvis, as regards size and lie ; and in correcting any abnormality of either kind before the uterus has begun to close on the child ; to at once deliver the woman, leaving all consideration of the child's prospects out of consideration, if the signs of obstructed labour become evident (p. 408). The improper use of ergot and of turning must be avoided.

After rupture has occurred, the case will have to be considered under one of two headings ; (*a*) where no part of the ovum has escaped into the peritoneal cavity, and (*b*) where the peritoneal cavity has been opened, and there has been some such escape. That is, the cardinal point is whether the peritoneum is or will be contaminated by the blood and liquor amnii at the time or by the discharges from the wound before this has been shut off by lymph from the general peritoneal cavity, or whether it will not. In cases where the shock is so great that the woman dies very soon, there is little or no chance of treatment.

Under any circumstances the child must be at once extracted with the placenta. If this is easy by the vagina it will be best to extract it by that way, after perforating, decapitating or what is necessary to enable the child to pass through the parturient canal. If the child is at all gripped by the edges of the rupture, or *à fortiori* if it has escaped into the abdominal cavity, the abdomen must be opened. The extraction of the placenta must be conducted on the same principles.

After removal of the child by the vagina the interior of the uterus must be

examined by introducing the hand. An anæsthetic will be necessary, and if ether is available it will be well to use it.

Possibly a loop of intestine may be found in the uterus or vagina; or the fingers may come into contact with peritoneal surfaces if passed through the wound. Tears in the posterior wall are certain to have reached the peritoneal cavity; but those at the side may have opened up the broad ligament only, and the extravasation of blood and other fluid is then extra-peritoneal.

If the child has escaped into the peritoneal cavity, or is partly through and is gripped by the edges of the rent, no force should be used in attempts at extraction per vaginam, but preparations should at once be made, if the woman is in an at all hopeful condition, to perform abdominal section, and remove the ovum that way.

The abdomen is opened in the same way as in a Cæsarian section (see p. 396 for full details). The child and placenta, if the latter also is in the abdomen, are now to be removed, and the peritoneal cavity well washed out with plain water at a temperature of about 105° to 110° F. This frees the peritoneum from blood, meconium and liquor amnii, and cleans the edges of the rent. The rent is now to be found, and if it is not low down on the posterior wall and inaccessible, it should be sutured as after Cæsarian section.

If the tear cannot be well got at so as to be sewn up, a drainage-tube of large size should be passed through the tear into the vagina, where its lower end should be surrounded with iodoform gauze (fig. 330). Or iodoform gauze may be used for the drain altogether, a wisp of it being passed in the manner directed for the tube. The abdominal end will in a few hours be surrounded by lymph and isolated from the general peritoneal cavity. Either the tube or the gauze may be removed in forty-eight hours.

The most convenient position in which to put the woman during the operation is what is known as Trendelenberg's, or the raised-pelvis position. This can be managed, as suggested by Herman, by 'putting on the bed a chair resting on its top rail and the front of its seat, and pinning a towel over its legs. The patient is then placed on the back of the chair, her knees being supported by the towel.'

After the intra-peritoneal part of the operation is done the abdomen will be sewn up as usual (see p. 399).

Supposing that the case is not one where it is necessary to open the abdomen, as where the tear is incomplete, or into the broad ligament; or supposing the physician does not feel equal to abdominal section, or the woman's surroundings are unfavourable, it will still be necessary to wash the tear, and the abdominal cavity or the cavity in the broad ligament with warm water as in the more serious operation. Plenty of water should be used for this purpose, and the tube must be introduced well into whatever cavity is being irrigated. The drain must next be arranged, and in this case it will have to be pushed upwards from the vaginal aspect of the wound.

Porro's operation has been recommended and performed for this accident. It can only be of use when the rupture is confined to the body, as the cervix cannot be removed or secured in this way (see p. 401 for a description of the operation). This objection is of course stronger if the tear extends into the vagina. Complete removal of the uterus per

abdomen would answer well in cases where the vagina was not injured, but it is too long and tedious an operation to be the best in this particular case.

The treatment may be **summarised** as follows :—

If the presenting part is in the vagina, extract at once.

If the lie is transverse decapitate, or if the child is hydrocephalic or the pelvis contracted, perforate, and extract at once.

If the breech is presenting, use the blunt hook, and if necessary perforate the abdomen and the after-coming head, and extract at once.

Get the placenta out through the vagina if this can be done without force.

If the child or enough of it to be gripped is through the rent, or if the placenta has passed through, do abdominal section, and, if possible, suture the tear accurately, cleansing the peritoneal cavity by irrigation ; if the tear cannot be accurately sewn, drain.

If abdominal section is not done, cleanse the tear and the cavity opened up, and drain.

In rare cases the peritoneal coat is alone ruptured. The tears in this are always found on the anterior or posterior surface, and are to be ascribed to want of elasticity in the peritoneum (see p. 100). They seem to be always very numerous, or at all events have been so in the fatal instances which have been described. Death occurs from shock or from hæmorrhage into the peritoneal cavity. They are undiagnosable.

Lacerations of the Cervix

These are for the most part merely exaggerations of the tears which occur at nearly every labour, and are therefore mainly in a longitudinal direction. When the tear extends upwards into the supra-vaginal cervix the base of the broad ligament is opened ; and downward extension involves tearing of the upper part of the vagina. Transverse or circular tears are due to nipping of the cervix (see p. 428) or to the anterior lip being carried down, as in cases of premature rupture of the membranes, and being crushed between the head and the back of the pubes.

These tears are of no great importance in themselves, except that occasionally they give rise to troublesome hæmorrhage after the child is born ; and indeed this bleeding may be mistaken for hæmorrhage from the placental site. They are, however, most important as being possible channels through which septic organisms can enter. When a circular piece is nearly torn off it may slough and give rise to septic danger.

The bleeding is best treated in these cases by plugging the cervix for a few hours with iodoform gauze, for attempts at suture—which would, if feasible, be the correct treatment—are practically useless. Strict antiseptic conduct of the case will ensure safety from absorption, and any very loose pieces may be at once cut off.

Lacerations of the Vagina

The injuries in this case may be caused by the pulling up of the lower segment in prolonged labour, as in a transverse lie (p. 466) ; by rigidity

of the vagina, such as may be (but is rarely) found in elderly primiparæ ; by the action of instruments in the vagina, especially forceps ; or by the introduction of the hand with violence ; or by extension from the cervix.

Anatomy.—The rupture may reach the peritoneal cavity if it takes place in the part of the vagina in relation with Douglas' pouch, but not otherwise. The tear is usually transverse, since the tension, where this is the cause of rupture, is mainly longitudinal. The tension is rarely transverse or circular, for if a head has come through the cervix it will always come through the vagina, unless the latter is cicatricial or abnormally small.

Laceration occurs mainly under two conditions : (*a*) In transverse lies, in which, owing to the cervix not being nipped by the presenting part fitting the brim closely (see p. 466), it is drawn up as the uterus undergoes retraction, and the tension comes on the vagina as much as on the cervix. The vagina is the thinner of the two, and the tension, by the time the cervix has been drawn above the greatest circumference of the head, is still further increased. (*b*) In pendulous belly (anteversion of the uterus) it has been explained that the vaginal walls are unduly stretched (fig. 247, p. 272).

The tears which extend down from the cervix are as a rule longitudinal. When, however, laceration is caused by the use of the forceps, the tear may be in any direction. If it is caused by the edge of the forceps projecting above the general plane of the head-surface in cases where the head rotates and the forceps is held too tightly, the tear is mostly longitudinal ; but if it is caused by forcible dragging of the head through a vagina which is unable —owing to cicatrices or other organic narrowing—or has not had time to dilate, the tear will probably be mainly longitudinal also, though in the latter case it may be transverse or oblique.

Symptoms.—Unless the tear is a very extensive one, or opens the peritoneum, there is nothing to call attention to the accident but an amount of bleeding which is according to circumstances.

The tears are, as in the case of the cervix, possible channels of septic infection, but in a greater degree, since they are nearer the external air, and are more likely to be contaminated by decomposing matter.

Treatment.—If the tear involves the peritoneum it will need exactly the same treatment as a correspondingly grave uterine rupture. If the child has escaped into the abdomen, as may happen, abdominal section is indicated, as in the case of the same event from rupture of the uterus ; and drainage and careful antiseptic treatment are equally necessary. When the laceration is in the lower part of the vagina, which is less common, the rent may be sewn up if it is large, bleeding freely, and within reach ; but otherwise it may be left alone, and attention devoted to keeping the parts as aseptic as possible.

Laceration of Submucous Tissue, Fasciæ, and Muscles

Near the lower end of the vagina there is sometimes a tearing of the submucous tissue : this is most commonly brought about by a glacier-like movement of different planes of this tissue on one another to an extent which ruptures their connecting fibres. The gliding is caused by the mucous

membrane being forced down by the head, which may carry a fold of it bodily down in front of itself. Such tearing of tissue brings about one kind of vaginal thrombus, the blood being extravasated between the superficial and deep layers ; the clot may suppurate, or may be the origin of one form of vaginal cyst.

No treatment is required for this condition if it be diagnosed, but rest and antiseptics are necessary to satisfactory healing.

Over-stretching and tearing of the levator ani muscle and of the fascia forming the pelvic floor (pp. 86 and 89) have been described, but no cases have been dissected.

Laceration of the Perinæum

Lacerations never extend further back than the anus : they usually begin at the fourchette, which is nearly always torn at the first labour, and extend backwards to a variable distance, the most complete ones thus involving the anterior part of the sphincter.

In this, the ordinary kind of rupture, the whole thickness of the tissues included between the skin and the mucous membrane of the vagina gives way (fig. 378 B).

Rarer forms are (1) a central rupture, where the first part to give way is the centre of the perinæum, or some point between the anus and the fourchette ; this tear begins on the mucous surface, and not at the anterior border of the perinæum, and perforates the pelvic floor, thence extending backwards and forwards, but not necessarily involving either fourchette or anus. The child has been born through such an opening. (2) Herman describes a form which begins in the recto-vaginal septum, and advances from above down. There is also (3) a variety where the same 'glacier movement' occurs as that described between the planes of tissue under the lining membrane of the vagina.

Causation.—The tear and its amount depend in all cases, even those of the smallest degree, on three factors ; (*a*) the size of the body which has to pass through the parturient canal—that is, the size of the greatest circumference which distends the vulvar orifice. The tear is practically always caused by some circumference of the head. The most and the least favourable diameters of the head have been already considered in the mechanism of labour. The shoulders rarely, if ever, begin a tear, but they not uncommonly enlarge one already commenced by the head. Their circumference passes more easily through the vulva than that of the head, since although it may be a little larger than some circumferences of the head, it encloses a softer and more compressible material.

(*b*) *Rapidity of Labour.*—This cause is shown in a most marked degree in instances of Precipitate Labour (p. 406), and in lesser degrees it is present whenever the head is too rapidly dragged through an imperfectly dilated vulva in extraction with the forceps.

(*c*) *Condition of the soft parts.*—The dilatability of the perinæal structures varies in different women. There is no rule by which the accident can on this account be foreseen, for in thick, resistant ones it is not oftener torn than in thin lax-fibred perinæums. Nor can any prognosis be made on

account of the length of the perinæum, for in cases where it is long this may be due to the anus being placed further back and more away from the symphysis than usual.

The perinæum is, however, no doubt more often torn in elderly primiparæ than in young ones, owing to diminished dilatability.

(*d*) *Formation of the Pelvis.*—The shape of the pubic arch is an important matter, for if this is very narrow the head has to pass through the outlet more posteriorly than when there is plenty of room for the skull to enter completely into the sub-pubic angle, and in consequence there is more yielding required from the perinæum. A most marked example is in the case of the kyphotic pelvis (p. 447) in which the child has in some cases to pass through the posterior half of the outlet, entirely behind a line joining the tuberosities.

(*e*) The perinæum is sometimes torn by rough handling and introduction of the hand before sufficient dilation of the vagina is present.

Method of tear.—The rupture in tears which begin at the fourchette is always antero-posterior, and though it is often somewhat irregular, it keeps about the middle line. This shows the direction of the stretching force, which is radial and not longitudinal. In cases of central rupture it is possible, though it has never been shown by dissection, that the force may act longitudinally, thus carrying the anterior part of a long perinæum forwards in front of the presenting part.

As the process is watched in the ordinary form, it is seen that the skin gives way first at the anterior border of the perinæum and all along the line of rupture, the subcutaneous layers parting just after. The angle of the tear is thus one with a bevelled face, the least amount of tearing having taken place in the mucous membrane. In the central tear it is believed that the rupture begins in the deeper structures, thus rather suggesting a glacier movement, and so a longitudinal force.

The tear looks very large while the head is still distending the perinæum, but after delivery it will diminish to about a quarter of this length, and will become thicker in its lips.

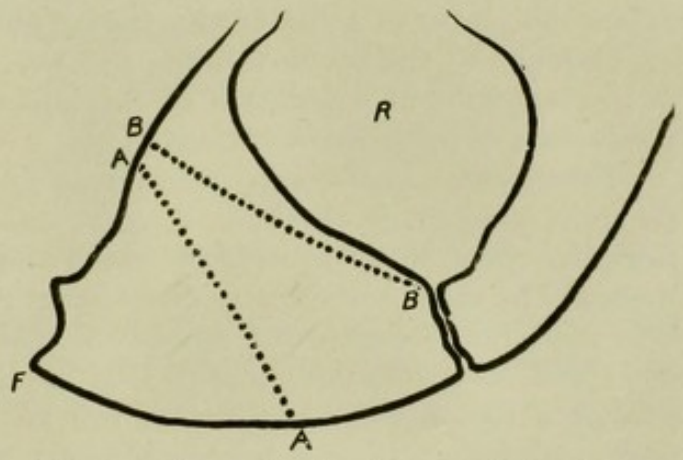

Fig. 379.—Laceration of perinæum. *F*, fourchette; *R*, rectum; *A A* incomplete, *B B* complete, rupture.

The process of rupture may stop short at any point in the length of the perinæum, or it may reach far enough to expose the fibres of the sphincter ani, sometimes forking as it reaches the ring of muscle and running for a fraction of an inch on each side of it, or diverging entirely to one side. Carried still further it goes through the anterior part of the sphincter, and possibly some distance (half an inch to two inches) up the recto-vaginal septum.

After an incomplete rupture (the sphincter not torn) (AA, fig. 379) the tear forms merely a prolongation backwards of the vulvar slit, the torn surfaces being

coarsely granular and oozing blood. The surface exposed at the angle of the tear is continued into the surface of the mucous membrane on the posterior vaginal wall (fig. 380). In the case of complete rupture, where the sphincter has gone, its ends may be seen widely separated from one another and marked by a depression in the tear. The sphincter flattens out, and no longer forms a ring, and the tear in the recto-vaginal septum forms an angle whose composing lines converge from the two ends of the sphincter (fig. 381).

Results, immediate and remote. (*a*) *Immediate.*—There is practically no bleeding, as the rupture is through the non-vascular middle line. The prospects of its healing if untreated are in the case of complete rupture almost none, for the edges are kept apart by the action of the sphincter. Complete ruptures have been known to heal, however. In the incomplete cases, healing will probably occur to some extent (or rarely even entirely) —though this is not to be relied on—if the parts are kept clean and at rest.

The most important immediate result is that a surface is produced at which septic absorption may take place freely. A perinæal tear is, in fact, the commonest site for the absorption of septic matter.

(*b*) *Remote.*—In the complete form the woman will have incontinence of liquid fæces. She acquires the power of retaining solid ones after a time. She may later on suffer from prolapse of the vagina, and subsequently from prolapse of the uterus. This is brought about, not by the loss of support to the parts caused by absence of the perinæum, but by interference with involution of the vagina, probably owing to septic absorption, or to too early getting up. The sub-involuted vagina finds its descent made easier by the absence of perinæum. Lacerations, by enlarging the vulvar outlet diminish the retaining power of the vagina for a ring pessary, which it is often necessary to apply in cases of vaginal prolapse. They also diminish to some extent the power of satisfactorily discharging the sexual function.

Damage to the fascia forming the pelvic floor is combined to a greater or less extent with laceration of the perinæum, and this will assist in the production of prolapse of various kinds.

Treatment.—In the case of any tear involving more than the fourchette the best practice is to stitch it up at once. If the woman is still drowsy from the effect of the anæsthetic which may have been given during labour, it should be done without any more being given. If the patient is unable to bear the pain without some anæsthetic, there is no reason for withholding it. Galabin recommends that two or more hours should elapse before the patient is narcotised, so as not to run any risk of relaxation of the uterus under chloroform; but it is probably best to put in the stitches before she has come to from the effect of the anæsthetic of the second stage, leaving them untied till after the placenta is expelled. There is no doubt that a better result may be expected from an immediate operation, both as regards healing and immunity from the danger of septic absorption. It also does away with the need for disturbing the woman during her first sleep.

Method of Suture.—The woman is to be placed on her back in a posture as nearly approaching the lithotomy position as can be managed under the circumstances. Suturing should not be done while she lies on her side, for in that posture neither can the extent of the laceration be properly seen,

nor is it possible to place the stitches accurately. The operation is also rendered more painful to the woman (if she is conscious), since the sutures will have to be passed from the outside inwards—that is, through the skin first, instead of from within outwards.

The material used for the sutures is unimportant ; but it is better to use one which will require removal of the stitches, for the result will then be necessarily seen when they are removed. Silk is the most comfortable for the patient : wire or silkworm gut may prick the skin when the patient moves.

The needle is a matter of some importance.. Whatever kind is used it must be one which is rigid along its curve if it be curved, or quite rigid if it is a straight one. The position of the point is then always known and the point can also be kept in the line wished, instead of being liable to be diverted by planes of tissue. Hagedorn's needles fulfil this condition better

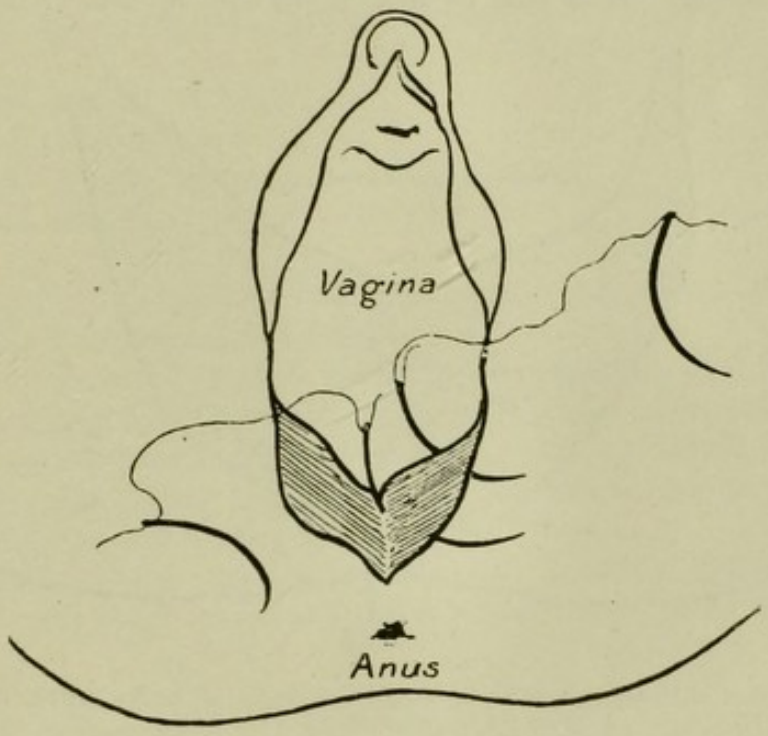

Fig. 380.—Suture of incomplete perinæal rupture.

than any. The writer is accustomed to use a 'half-circle,' or 'quarter-circle,' in a needle-holder which can be extemporised out of a Spencer Wells' clip. Or a needle in a handle may be used, but this is more difficult to keep well sharpened.

In a case of incomplete rupture the stitches should be placed about 1 inch apart in the thicker tissues, and about $\frac{1}{3}$rd of an inch apart in the thinner anterior lips of the tear. The posterior ones should be inserted first, and left untied. The needle must be entered in the middle line of the tear—that is, at the bottom of the wound, where the vaginal mucous membrane is not torn ; and on the vaginal surface, where the lips have free edges, for the skin is the most sensitive structure. In this way it is only perforated at the last moment, and the needle can also be passed more rapidly through it in an outward direction because counter-pressure can be applied to its surface as the needle emerges. When the needle is entered

on the skin-surface there is pain all the time the thread is being dragged through the tissues. The needle should be brought out at the edge of the wound, for then none of the skin is tucked in, and the edges come accurately together. The suture may be armed with a needle at each end, as is best, or the same needle may be threaded on to the end now at the centre of the wound. It (or the second needle on the suture) is then entered at the same point as that at which the first half of the suture entered, and brought out at a point in the skin-surface exactly opposite the point of emergence of the first half (fig. 380).

When all the stitches are inserted the wound should be carefully cleansed with warm water or a 1–2000 solution of corrosive sublimate, and the sutures tied.

In complete rupture the sphincter ani must receive special attention, for if the ends are not secured in apposition its action will infallibly prevent satisfactory healing. It is best to first of all sew up the torn recto-vaginal

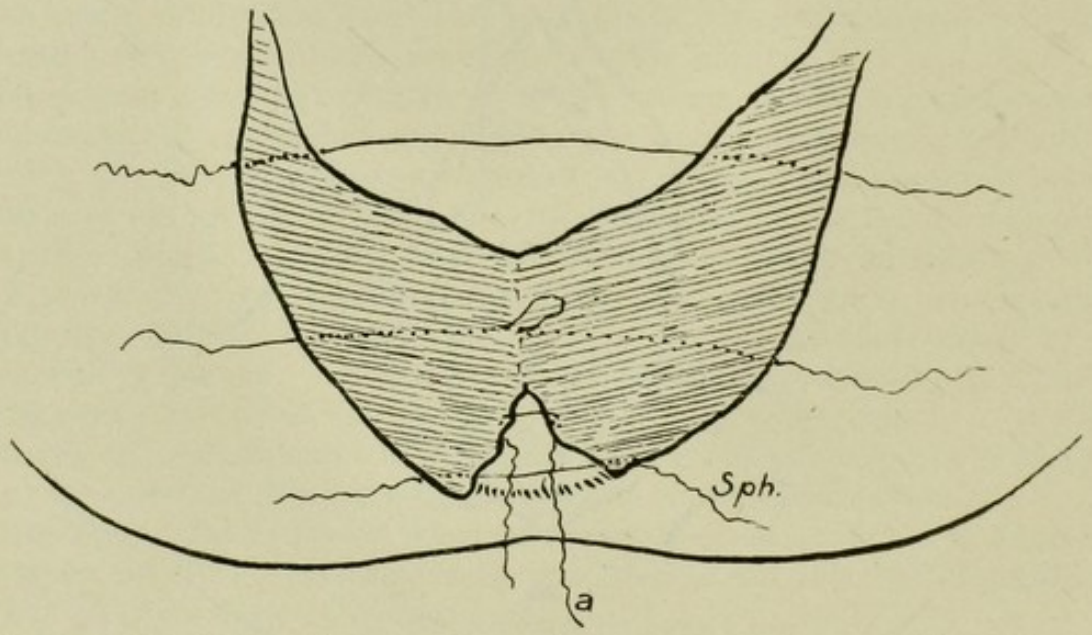

Fig. 381.—Method of inserting sutures in complete rupture. *a*, catgut sutures for recto-vaginal septum ; *Sph*, silk suture for sphincter.

septum with catgut stitches, as these can be left to be absorbed. They should be passed as in the diagram (*a*, fig. 381), and will be later on tied on the rectal side. The ends of the sphincter will be found at the angles of the tear, and the wound will now be as in fig. 381. The suture for the sphincter is of silk, and the needle such as the one described above. This is inserted about $\frac{1}{4}$ inch external to the end of the sphincter on one side, and brought out about the same distance on the inner (mucous) side of this end, then entered across this rent at a corresponding point internal to the opposite end of the sphincter, and brought out so as to secure the end of the muscle, as on the other side. The rest of the sutures are to be put in as in the operation for incomplete rupture, and then the whole series tied, beginning with the rectal ones (fig. 381).

The vagina should be douched twice daily with one of the antiseptic solutions recommended, for it is of importance that the wound be kept from contamination by decomposing vaginal secretions and lochia. The bowels

must be made to act on the third day as usual, and if there are any scybala in the rectum an oil enema should be given, so as to guard against the tearing apart of the edges of the wound.

Other Lacerations of the Vulva

Tears beginning at the vaginal orifice may extend into the vestibular region, or involve the labia minora. These tears are usually superficial, and are due to the stretching by the head of the part of the ring formed by the labia minora laterally, and completed by the frænum and præputium clitoridis in front. Sometimes the labia minora are button-holed. The cracks on the vestibule are irregular in shape, but usually radiate from the edge of the vaginal orifice: they sometimes embrace the urethra. The urethra itself is never torn, at least only three or four cases are on record in ordinary labour. In a series of 100 women (1-paræ and multiparæ) taken consecutively Auvard found that there was—

No tear of the vulva in	5
Perinæum alone torn	14
Lateral or anterior parts (perinæum intact)	32
Lateral and anterior parts and perinæum	49

These figures give an idea of the frequency with which these small tears may be found if they are looked for.

They are important if they reach an appreciable size for two reasons. They might cause some hæmorrhage which, if excessive, could be mistaken for post-partum hæmorrhage—bleeding from a torn clitoris has been known to be considerable; like other wounds of the lower end of the vagina they are dangerous for septic reasons.

Treatment.—These wounds seldom want a stitch, but they may. As a rule pressure for a few hours is all that is required if there is any bleeding.

Rupture of the Pelvic Articulations

The softening which takes place in the pelvic joints in pregnancy has been described (p. 48); and the structure of the joints rarely gives way. Rupture may occur in cases where there has been forcible extraction with the forceps in a contracted (usually transversely contracted) pelvis; and during this operation the symphysis, which is the synchondrosis usually damaged, has been heard to crack. These lesions usually heal without trouble. If the symphysis is much separated there is a strain on the sacro-iliac joints, just as occurs during symphysiotomy (p. 402). If the relaxation of the joints, especially of the symphysis, persists, it may be severe enough to prevent standing or walking. There is much pain felt over the pubes when the movement between the two ends is at all considerable, and sometimes movement can be made out on examination. It is easier to identify this when it is present at the sacro-iliac joints, as a good grip can be got of the crests of the ilia.

The only treatment is to make the patient, when she gets up, wear a strong pelvic band, reaching from the level of the crests of the ilia to below the trochanters. Matthews Duncan recommends that with this the woman should be encouraged to brave the pain and to go on walking, since the irritation caused by the friction on movement may set up some slight inflammation and fix the joints.

Physometra. Tympanites Uteri. Air or other Gas in the Uterus. Air is said to sometimes enter the uterus spontaneously during a long labour when the liquor amnii has drained away ; but it usually gets in while some obstetric operation is being performed which needs the introduction of the hand, especially if the intra-uterine pressure is relaxed. It is favoured also by relaxation of the abdominal pressure brought about by change of the posture of the woman, a sudden inspiration, or the like. Also in syringing, either intra-uterine or only vaginal, air may get in if care be not taken to expel it from the syringe before beginning to pump.

Gases of decomposition are given off where putrefactive organisms have been admitted to a retained dead ovum ; this condition is usually combined with septicæmia, and the uterus may become relaxed and tympanitic in serious cases of the kind. The prognosis here is very bad.

In the instances where air has been admitted there is always some danger of air-embolism.

Treatment.—If the physometra is due to the admission of air during an operation, and all is aseptic, there arises no need of treatment.

If there is the least decomposition the uterus must be cleared out and douched with some antiseptic in the way recommended for septicæmia and sapræmia (see p. 531).

If the child is alive when the air finds its way into the uterus it may make an attempt at inspiration, and a cry has in a few instances been heard in utero. The lungs of such a child, if examined after it has been born dead, would show signs of partial expansion, and one of the tests of live-birth would therefore prove fallacious under such circumstances.

Emphysema of the Neck and Neighbouring Subcutaneous Tissues. Numerous cases of this accident are recorded. The air finds its way out of the pulmonary vesicles ruptured by bearing-down efforts into the subcutaneous tissues of the neck, face, and thorax.

No ill-result beyond inconvenience seems to result from this condition. There is some pain for a day or two, and the emphysema gradually passes off.

Sudden Death in Labour and shortly after.—It is only necessary here to classify the causes, since, where they are directly caused by the processes of abnormal labour, they are dealt with under their respective headings.

1. Those directly caused by abnormal labour :

Embolism and thrombosis of the pulmonary artery and right side of the heart.

Air-embolism.

Syncope from post-partum hæmorrhage or placenta prævia, and shock from rupture of the uterus.

2. Those due to some previously existing condition, in which the fatal result is brought about by the exertion or disturbance involved in labour.

Certain forms of heart disease.[1]
Large cerebral hæmorrhages.
Profuse hæmatemesis, hæmoptysis.
Large pleuritic effusions.

3. Those which are purely accidental coincidences :

Poisoning, and the like.

Treatment.—There is no treatment for the woman beyond that already prescribed under each heading ; but the child must be thought of, and delivered immediately if possible, whether labour has begun or not.

The child may be delivered by Cæsarian section if there is time and opportunity (see p. 394). It is only of use if the woman has only occupied a few seconds in dying, and then only if the operation be done immediately. It is seldom that this can be accomplished, as the attention of the physician will be absorbed by the needs of the mother. If the woman's death has taken some time—half an hour or more, for instance—the child will probably be dead before she is. Before undertaking the operation, in any case it must be ascertained that the child is not certainly dead.

CHAPTER LXVI

CARDIAC AND PULMONARY DISEASES, ALBUMINURIA AND ECLAMPSIA

Cardiac Diseases

Mitral Stenosis and Incompetence.—Of these two stenosis is the more dangerous. Incompetence alone is, as a rule, of no great importance.

The effect of labour, speaking generally, is to raise the arterial pressure during the involuntary and voluntary efforts at expulsion. In the majority of cases,[2] the tension is still above the normal after-delivery, and so continues during the lying-in period. Where, however, there is considerable loss of blood during labour, the pressure must be diminished, for a time at all events, in a degree corresponding with the amount of blood loss.

The increased pressure embarrasses through the lungs the right ventricle, which, on account of the inefficiency of the mitral valve, is only imperfectly protected, and the embarrassment must be considerably increased during the actual bearing-down efforts. The ventricle might be expected to give way then in consequence, but this is not common in either variety of valvular disease. The dangerous period is during the first week after delivery.

Aortic Incompetence.—The effects of this condition of the valve seem to be greater in proportion during pregnancy than during labour. If the woman

[1] See also Boxall's case of escape of the heart from an imperfect pericardium, *Obst. Trans.* vol. xxviii.

[2] Probyn-Williams and Cutler, *Obst. Trans.* vol. xxxvii, p 19.

gets over the strain of the bearing-down efforts the embarrassment passes off as she remains quiet ; for the activity of the circulation is much diminished, and the left ventricle, hypertrophied before, and probably to an increased extent during pregnancy, is easily able to do the necessary work. If the labour is prolonged, and expulsive efforts are severe, and if the compensatory hypertrophy is insufficient, syncope will be very probable.

Treatment.—In any kind of heart disease, if there is a tendency to syncope, the woman must be kept as quiet as possible, and labour must be assisted very early with the forceps. Bleeding may be necessary to relieve the right side of the heart ; and digitalis, strychnia, and other cardiac stimulants, according to the kind of valvular disease present, should be given hypodermically or by the mouth.

Pulmonary Diseases

These are dangerous complications of labour, if they are of a kind to cause much obstruction to the pulmonary circulation. The heart is taxed in this case to a greater degree than normal, and after delivery there is still the obstruction just as in the case of mitral stenosis.

Treatment.—There is nothing special about this. It is that required for over-distended right heart ; namely, bleeding when necessary, and assistance with the forceps as early as possible.

Albuminuria

As far as our present knowledge is a guide it is best, although albuminuria is a disease of pregnancy, to take it into consideration now immediately before eclampsia is dealt with, since the most remarkable character of the albuminuria of pregnancy is its tendency to be complicated by eclampsia ; and on the other hand, eclampsia is practically never found to occur in the absence of albuminuria. Their relations, whether causal or not, can thus be more conveniently discussed.

Albuminuria is of far greater severity and importance during pregnancy than at other times, and the reason of the increase of danger to the woman when the two conditions are co-existent is not as yet clearly understood. The fact that the urinary trouble is part of a more severe disease when it is combined with pregnancy is shown by the subsidence of the more marked symptoms, such as œdema, headache, and also by the disappearance of much of the albumin, on the termination, artificially or naturally, of the pregnancy ; and also by the fact that the disease is liable to lead to more acute results if it is found in a gravid woman than when it occurs in any other person.

A reason for the greater intensity of the disorder is provided by the increased blood tension (see p. 56), and also by the parenchymatous change in the liver, kidneys, and other glandular organs normal to pregnancy. This last will diminish the power of resistance of the renal epithelium, and possibly in other ways interfere with the proper manufacture of the blood.

The greater tendency to convulsive attacks is most likely due to the rapid accumulation of waste products, owing to the gland changes ; and, to

a very great extent, to the inferior stability of the female nervous system at this time, a character which is displayed in the tendency of women with a hereditary taint of insanity, to become mad while pregnant and puerperal, and in a lesser degree by the mental disturbances which pregnancy is apt to cause in ordinary women.

The cases seem divisible into two very distinct groups, of which the respective immediate effects and prognosis are to some extent in contrast with one another.

(*a*) Those in which the nephritis has gradually appeared, and in most cases has probably existed before the present pregnancy.

(*b*) Those in which the albuminuria has appeared during the present pregnancy.

In other words, one (*a*) is a chronic Bright's disease ; and the other (*b*) an acute condition of albuminuria—possibly an acute nephritis, or possibly only a temporary functional disturbance of the kidney, which may or may not be caused by a blood change not as yet understood.

Causation.—That of (*a*) need not be considered here, except so far as to mention that it may have arisen during, or have shown itself at, some previous pregnancy.

In the case of (*b*) there are many theories, in support of any one of which there is little but conjecture. The principal ones are :

1. That the ureters are obstructed by the pressure of the gravid uterus. This may sound plausible as accounting for some of the acute cases where albuminuria rapidly appears ; and then as rapidly diminishes directly the uterus is emptied, or rather immediately the liquor amnii is tapped, and the uterine bulk lessened. It must be abandoned, however, since there has never been any œdema of the kidney found post-mortem, and this is a constant change where the ureters have been ligatured or otherwise experimentally obstructed. No dilation of the pelvis of the kidney nor of the ureters above the point of supposed obstruction has been found.

2. That there is increased work thrown on the kidneys by the addition to the blood of the fœtal waste products. Against this hypothesis it may be said that after excision of one kidney the other will at once prove itself equal to the work of two, and it can therefore hardly be true that the addition of the comparatively small amount of waste product from the fœtus or embryo (for albuminuria may begin before the third month) is enough to cause the least embarrassment.

3. That it is caused by the increased arterial pressure normal to pregnancy. When the renal and splanchnic nerves are divided, so that the blood pressure in the kidney is enormously increased, no albuminuria is found, nor is it in any other experiment by which the intra-renal arterial tension is increased. The amount of albumin is small in the high tension of chronic Bright's disease, with arterio-capillary fibrosis. It has also been shown that increase of filtration pressure diminishes the permeability of a membrane to albumin.[1]

4. The old theory of 'reflex' interference with the function of glandular

[1] Runeberg, *Arch. der Heilk.* vol. xviii. p. 1.

organs is a hypothesis which hardly accounts for long-continued effects such as that now being considered.

5. That the venous return from the kidney is impeded by the increase of abdominal pressure brought about by the growth of the uterus.

When the uterus is large enough to considerably raise the abdominal tension, and also to be pressed directly against the back of the abdomen by the reaction of the anterior abdominal wall, it is possible that the renal veins may be narrowed, or at all events the return of blood from the kidney retarded, and the pressure on the venous side of the kidney thus increased. A slight narrowing of the renal vein is found experimentally to immediately decrease the quantity of urine, but never to suppress it.[1] After a few hours, the urine, which becomes albuminous at once, contains red corpuscles and casts (hyaline). This change is due to damage of the tubular epithelium, and to the fact that 'any considerable circulatory disturbance renders the membranes concerned in the excretion permeable to albumin' (Cohnheim).

Albuminuria is not very uncommonly found in the urine of patients who are the subjects of large abdominal tumours.

Albuminuria, however, occurs in pregnancy before the uterus has reached anywhere near the level of the renal veins, so that this cannot be the only cause. It is true that the quantity of albumin in such early beginning cases is as a rule small, and the disorder perhaps might, in some instances, be referable to group (*a*). The amount of albumin in group (*b*) is as a rule large and first appears late in pregnancy, so that in this class renal venous obstruction is a not unlikely cause. In a case of Herman's, where there were both twins and hydramnios, the albumin diminished from enough to make the urine solid on boiling before delivery to a trace only on the fourth day after delivery, with an increase to five times the quantity of urine passed during the day. This form of albuminuria is commoner too in primigravidæ, where the abdominal walls are still unstretched, and thus presumably keep the intra-abdominal pressure high. It must be remembered that diminution of the abdominal tension means also diminution of the general blood-pressure, and that bleeding is found to have the same effect in diminishing the amount of albumin for a time as is produced by evacuation of the uterus.

Morbid Anatomy.—In all fatal cases some change in the kidney has been found. In class (*a*) the disease may be originally nephritis, the acute tubular variety, but this is rare; or the chronic tubular; or the chronic interstitial form. These have acute tubal nephritis superadded when the disease is fatal by the kidney alone; but death may be caused by hæmorrhages into the nervous centres and in other ways.

In class (*b*) 'congestion' has always been described, though many specimens are mentioned as being 'pale' in appearance. (This was no doubt the pale cortex of acute tubal nephritis.) Tubal nephritis, commencing or established, has been found in all their cases by many, and especially by more recent authors.

Practically all the deaths occurring in this class are due to eclampsia or its effects when death is not caused, as much less often happens,

[1] Robinson, *Med. Chir. Trans.* vol. xxvi. p. 61; and Weissgerber and Perls, *Arch. f. Exper. Path.* vol. vi. p. 113.

by septic affections arising after labour, or by pneumonia or post-partum hæmorrhage.

Symptoms and Course of the Disease.—The symptoms in class (*b*) do not often show themselves before the seventh month, and come on very rapidly. There may be œdema, but there is often none. There is usually some headache, with vertigo and vomiting. Sometimes, however, the first thing noticed is a convulsion.

The albuminuria is always very marked, and the precipitate consists mainly, according to the records of Herman's patients, of paraglobulin.

Serum-albumin may, if cystitis is excluded, be taken as evidence of pathological change in the kidney substance ; paraglobulin is sometimes a temporary abnormality, and may entirely disappear when the exciting cause has been done away with.[1]

Paraglobulin is present in cases of chronic renal disease, but is in small quantity ; whereas in the acute form of albuminuria of pregnancy it is in large proportion, and patients who have eclampsia pass urine in which the greater part of the albuminous precipitate consists of paraglobulin.[2]

In class (*a*) the albuminous precipitate in the urine is mainly serum-albumin ; the woman has headache, œdema, and vomiting if the attack is acute at the time ; and if the kidney-disease is of long standing there will be the usual changes in the circulatory apparatus caused by increased arterial tension. There is a persistent, high-tension pulse, and casts are to be found in the urine.

The woman will be also more than usually liable to the accidents and complications of kidney cases. She may be attacked with paralysis of various kinds, retinitis and optic neuritis often occur, and there may be very considerable œdema of the subcutaneous tissues and of the lungs. It is in the chronic interstitial form that these complications are most likely to arise. In any case belonging to class (*a*) there is, since the disease is in existence at the beginning of pregnancy, a much longer time available in which secondary changes can develop.

As far as the pregnancy itself is concerned the woman is very liable to abort. The fœtus dies, and is usually expelled, but sometimes is retained and undergoes maceration. Its death is probably nearly always due to some change in the composition of the mother's blood ; but is sometimes brought about by serotinal hæmorrhages (see p. 248).

The tendency to hæmorrhages, which is found in ordinary cases of chronic Bright's disease, may also show itself as bringing about accidental hæmorrhage or post-partum hæmorrhage.

The woman is also liable to septicæmia (especially after an attack of hæmorrhage), and to mania (see p. 556).

[1] Maguire, *Lancet*, 1886, vol. ii. p. 524 ; and Ralfe, *Diseases of Kidneys*, p. 107.

[2] The best test for this substance is to treat the urine with a saturated solution of magnesium sulphate ; or better, to saturate the urine itself with the salt. This precipitates the paraglobulin only. The mixture is then filtered, and the residue washed with a saturated solution of the salt. The paraglobulin remains on the filter ; and the serum-albumin, still in solution, is in the filtrate. This last can be precipitated with heat or nitric acid. The residue on the filter is dissolved in warm distilled water, and precipitated again by heat or nitric acid. The relative quantities can then be compared.

Diagnosis.—In investigating a case in which the symptoms have suggested an examination of the urine, only urine which has been drawn with a catheter is of any value, owing to the possible contamination by vaginal secretions of urine passed in the ordinary way.

Evidence of cystitis in the shape of pus-cells must be looked for. If there is obstructive cardiac disease the probability of some, at least, of the albumin being due to congestion of the kidneys from that cause must be remembered. Casts (epithelial and hyaline) are valuable evidence of renal disease.

Small quantities of albumin are found in normal cases in the later weeks of pregnancy, and in nearly all women for a short period after labour, so that unless there is an appreciable quantity of albumin the case must not be at once put down as one of nephritis.

Prognosis.—In most, probably all, cases in class (*a*) the albuminuria, though it may diminish to a mere trace after labour, remains, because the renal disease is of an established kind ; and it will recur in future pregnancies. Some of the complications mentioned, notably the retinitis, may also, having become quiescent in the interval, re-awaken and advance at the next and subsequent pregnancies.[1]

In class (*b*) the cases are likely to have eclampsia, especially if they are primigravidæ ; but if they survive this they have a good chance of complete recovery. It is said that a few of these cases go on to chronic renal disease of the interstitial form ; but this is probably rare.

Treatment.—This is simple. *Albuminuria, which begins early* in the third month, for example, must be treated in the ordinary way by restricted dieting, purgation, diaphoresis, and by flushing the kidneys. There is great doubt as to the advantage of placing chronic cases on a low and restricted diet ; they often do much better on a fully nutritious one.

But sub-acute or acute exacerbations of chronic nephritis are perhaps better treated in the meantime by avoiding much nitrogenous food, and by giving a plentiful supply of milk and little else. The conditions are rather different here from those which prevail in non-pregnant persons. The aim of treatment in pregnant women is in great degree to see if the albumin can be got to diminish ; since, if it cannot, the attack can readily be cut short by the induction of abortion or premature labour. In other cases the treatment is the beginning of a long business, in the course of which it may be difficult to decide whether it is better to strengthen the patient, making the kidneys a comparatively secondary consideration ; or whether the better way is to try to restore the kidneys as soon as possible even at the expense of the general nutrition of the patient.

If then in the present case a milk diet and other treatment do not lead to considerable diminution of the albumin in a short time—and a fair time to allow is from ten days to a fortnight, according to the gravity of the case, and only so long if the case is free from complications—labour should be induced without delay.

[1] In a case under the care of the author, labour was induced on three successive occasions within three years, once in the General Lying-in Hospital, and twice in St. George's Hospital, on account mainly of the albuminuric retinitis, which subsided after induction, but which seriously affected her vision when she again became pregnant.

This is necessary now ; for the patient, having been put under the best conditions for recovery, and not being markedly better, is not likely to improve while she is pregnant ; her kidneys are undergoing damage all the time from the mere passage of albumin, or at all events from the persistence of the condition which is causing the albuminuria ; and the child will not in the large majority of cases survive.

If retinitis occur, there should be no hesitation about emptying the uterus, even if the albuminuria and other signs of renal disease are slight ; and the same is of course true in cases where any paralysis, however slight, has made its appearance.

If the *albuminuria first appears near the end of pregnancy*, and there is much albumin and scanty urine, active measures must be undertaken at once, and no palliative treatment must be attempted. The woman must be freely purged, and on account of the possible imminence of eclamptic convulsions bromides and chloral should be given in large doses on any suspicion of a threatening of fits ; and preparations should be made for inducing labour at once under chloroform. If the woman is a primigravida, the case is the more urgent (see last page).

In cases where the quantity of albumin present is small, and the urine is passed in fair quantity, the pregnancy may be allowed to go on, the woman being carefully watched until the eighth month [1] or longer, if no threatening symptoms occur.

Eclampsia

Definition and Pathology.—The convulsions in cases of puerperal eclampsia are of an epileptiform character. They occur before and during, and sometimes after labour. They are always associated with albuminuria, and are now pretty universally believed to be due to renal insufficiency, or at all events to the retention of some waste products which are normally excreted by the kidneys. In a few cases there may be other toxic substances present in the blood than those specially excreted by the kidney, but at present there is no definite information as to how often this occurs. Instances have been reported, however, where changes in organs other than the kidneys—the liver, for instance—have been found ; and there is reason to believe that albuminuria, though constantly associated with eclampsia, is in a few cases merely an accompaniment of some blood-change not yet understood.[2]

The fits, in the very large majority of cases, however, may be considered to be uræmic ; and it is a peculiarity of pregnancy that in it fits are of infinitely more frequent occurrence in persons affected with albuminuria than in those so affected apart from pregnancy, in whom, indeed, excepting in scarlatinal cases, uræmic fits are very rare.

There is a more or less definite relation between the amount of urine, of albumin, and of urea passed and the occurrence of convulsions. Herman

[1] It is extremely difficult to rear a seven-months' child, although this amount of maturity is usually considered sufficient to ensure viability. In reality a very small proportion of children so immature as this are ever reared.

[2] In two cases described by Sir John Williams leucin and tyrosin were found in the urine, and there were other signs and symptoms suggestive of acute atrophy of the liver. *Practitioner*, January 1895 ; also see Doléris and Butte, *Nouv. Arch. d'Obstet. et Gyn.*

found that in the acute form, which usually leads to convulsions, a large quantity of albumin was passed (mainly paraglobulin), that there was great diminution in the amount of urine and of urea.[1]

The scantiness of the urine is most marked in the cases belonging to class (*b*) (see 'Albuminuria'). In chronic renal disease there is usually a large quantity of urine passed.[2]

It is quite likely that, in addition to the large quantity of water passed in the total urine, the tolerance bred of custom may enable the woman who has suffered from chronic albuminuria for some time previously to escape fits.

The Fit.—The fit resembles that of epilepsy when it is fully developed, but it rather more rapidly reaches the stage of clonus. No mention has ever been made by any observer of an aura, such as is not uncommonly found in true epilepsy, and such a preliminary event probably does not occur. The most important distinction between the convulsions now being considered and the last-mentioned is that *the fits in epilepsy are single* in almost all cases, and *in puerperal eclampsia they are almost invariably multiple.*

Premonitory symptoms.—There is sometimes no warning that a fit is impending, and the woman appears quite well; or possibly there may have been some œdema noticed for a shorter or longer time beforehand. Usually, however, there are some symptoms of uræmia, such as headache, neuralgias, pain in the epigastrium. If the pulse is examined it will be found to have a high tension.

The fits are commonest during the last two months of pregnancy. The actual moment of onset probably depends on an accumulation of the poison, and, when this has reached a certain degree of concentration, the trigger is pulled, so to speak, by some disturbance of the nervous system, such as the first pain of commencing labour, or a vaginal examination. Sometimes, as far as can be seen, the fit comes on spontaneously; for instance, in the seventh month, well before labour has begun, or during the puerperium.

The convulsions last about one or two minutes, and the woman may bite her tongue and pass urine and fæces as in epilepsy. A more or less comatose condition follows, and is as a rule succeeded after a few minutes, or possibly several hours, by another fit. The number of fits varies from two or three up to, in severe cases, as many as a hundred.

The frequency of the fits depends on and indicates the severity of the attack. In the severest instances the patient falls into a condition similar to the *status epilepticus*. The temperature rises to 107°, 108°, or even to 110° F. The woman is quite comatose, and the fits succeed one another

[1] *Obst. Trans.* vol. xxxvi., where there are references to numerous other papers by the same author and others on the subject.

[2] This agrees with the results of Voit's experiments on dogs fed on urea, in which, if there was an unlimited quantity of water allowed them, there were no fits, because the 'poison' was all carried off; but on diminishing the amount of water taken to a very little, or withholding it altogether, the uræmic condition appeared (*Zeitsch. für Biologie*, vol. iv. p. 116, *et sqq.*) It has been found, also, that the injection into the blood of dogs of all the constituents of the urine (the ureters being ligatured) was more rapidly fatal than the injection of urea alone; so that no doubt the amount of urea excreted under these circumstances is only a measure of the excretion of urinary solids in general.

almost uninterruptedly. This shows great injury of the nerve centres, including the heat-regulating mechanism. There is no effect on the temperature in moderately severe cases.

During the fit there is not uncommonly an increase in the amount of albumin passed.

Effect of Fits on the Fœtus.—The child is, as has been mentioned, not rarely killed by an amount of kidney disturbance not sufficient to bring about a convulsion, so that it may be easily imagined that when there are fits the child is not very likely to survive. It has been known to do so, however. Death of the fœtus may be due also to the asphyxia of the mother during the fit; but this is not very likely, since the fœtus can live without oxygen for a longer time than its mother can. If the tetanic contractions of the uterus described by Braxton Hicks[1] are universal or usual, cessation of placental circulation sufficiently long to asphyxiate the child would take place; but they are not allowed by all observers to be present during the fits.

The condition of the urine in connection with the fits has been already mentioned. Hicks has described cases where there was no albuminuria until after the fit; but such cases must be phenomenally rare.

After delivery the fits cease at once or very soon, and the urine loses some of its albumin and, if in class (*b*), eventually the whole. Even in class (*a*) the albumin is diminished, but probably never disappears; and, as far as remote prognosis is concerned, except for the liability of the renal trouble and its complications to recur in future pregnancies, the woman is in the same condition as any male with a chronic nephritis.

In cases that are going to do well the quantity of urine and urea invariably increases in twenty-four hours or so to the normal, or to much more than normal. If no improvement in this respect occurs, the prognosis is bad.[2]

Morbid Anatomy.—There is in all recent cases which have been examined more or less tubal nephritis. The cortex is pale and the pyramids congested.

Diagnosis.—Eclampsia has to be distinguished from hysteria, from epilepsy, and from apoplexy. There should not be any difficulty in this. The absence of unconsciousness, of violent convulsions, of illness, combined with a self-conscious manner easily recognised, is enough to make the condition of hysteria unmistakable. On testing the urine for albumin there is, of course, none. In the case of epilepsy the fit is single, there is almost always a history of the disorder having occurred before, and there is no large quantity of albumin, though there may occasionally be a little.

The convulsions in apoplexy are not marked; they are usually unilateral and they do not soon recur when once they have ceased; there is only a little albumin present in the urine, which may be that characteristic of chronic Bright's disease.

[1] *Obst. Trans.* vol. xxv. p. 118. In one case the uterus remained tightly contracted for ten to fifteen minutes during the fits.

[2] See Herman, *loc. cit.*

Prognosis.—This is not good. The mortality of all cases is about 30 per cent., that of the children being about 50 per cent.[1] The earlier in pregnancy the fits begin the worse the prognosis; and on the other hand, the percentage mortality in cases where the convulsions begin after labour is a small one, being about 8 per cent.

Further gravity is given to the prognosis by the presence of complications—Septicæmia, Pneumonia, and Post-partum Hæmorrhage. The failure of the urine and urea passed to increase after labour is a bad sign; and if there is any retinitis the outlook for the future is not a very bright one.

The Prophylaxis in cases of albuminuria has been described as the treatment of Albuminuria in Pregnancy.

Treatment.—There are many ways of treating the convulsions of pregnancy, and most of those described are identical with the mode of treatment of cases other than puerperal. The class of case under consideration differs, however, from the fits of scarlatinal nephritis, for instance, inasmuch as they can be arrested at once by emptying the uterus. The first thing that will suggest itself, therefore, is the *induction of labour*, and the induction must be done by the most rapid means available consistent with safety. *The administration of chloroform* is found to check the fits, and in nearly all cases to prevent their recurrence.

Looked at from the point of view of the child there is not much hope of its being born alive, so that unless for some great reason for attempting to save the child's life, or possibly in a case where the mother is the subject of some disease such as cancer, soon to become fatal, the child must be left out of consideration altogether.

Induction of Labour.—The best way to do this is by administering chloroform and puncturing the membranes. The actual letting-off of some of the liquor amnii and the consequent diminution of intra-abdominal tension has at once a favourable effect on the fits, diminishing them in frequency. The cervix can then be dilated with one of the forms of hydrostatic dilator. Champetier de Ribes' bag is the best, for with this instrument one insertion is sufficient to completely dilate the os, and the disturbance and septic danger of frequent vaginal manipulations is obviated (p. 509). Labour will be usually rapid, but if there is any delay and urgency arises, the forceps must be early employed. If the child is found to be dead, craniotomy should be at once performed.

Chloroform.—As already said, this drug prevents the occurrence of fits nearly always, but it has even a further action than this. When it is administered to a woman in the *status epilepticus*, the cyanosis is found to diminish, the breathing to improve, and the pulse to slow. It seems to prevent also the pyrexia which may occur then. It should therefore be given under all circumstances, and the anæsthesia may be kept up for many hours in a modified degree in cases where this is necessary.

Diaphoretics.—The only diaphoretic of any use is hot wet-packing. Pilocarpin is dangerous, owing to its filling the bronchial passages with

[1] These are the figures given by Galabin, and they agree fairly well with those of Herman and others.

mucus, and its effect is very uncertain in these cases.[1] It is not really of much use to spend time in trying to excite sweating.

Cathartics.—It is most useful to purge the woman freely at the first opportunity; it does much good eventually, if not at once, and it does not interfere with other treatment. If she is conscious, a drachm or more of pulv. jalapæ co., or ten grains of calomel, or castor-oil containing two or three minims of croton oil, are among the best. If the patient is unconscious, croton oil in a small lump of butter slips down pretty easily.

Sedatives.—Apart from chloroform, the commonly used drugs are chloral, the bromides, and morphia. The first two are most useful after labour if the fits still continue; they seem to act best in combination, in the quantity of half a drachm of each given either by the rectum or the mouth. If chloroform cannot be obtained they may be given before labour. They have not, however, a powerful action on the fits. Morphia has often a very marked action, and in the absence of chloroform is always well worth trying. It is not a good drug for renal cases, and should not be repeated unless urgently required.

Venesection.—Blood-letting will almost invariably stop the fits, at least for a time, and it used to be *the* remedy for convulsions. It may act in some cases as it does in other convulsive disorders, tetany for instance, by knocking the patient down, so to speak; but in many instances it must do good by relieving the vascular tension. It has the disadvantage that since renal patients are frequently anæmic, or likely to become so, it deprives them of some of the blood they will badly want later on. It is true though that puerperal eclamptics are not always, in fact are often not, anæmic, and in the absence of chloroform, bleeding to say ten ounces is good treatment. There is one condition where it is necessary, altogether apart from any effect it may have on the fits themselves: namely, where the right heart is over-distended, and the venous engorgement must be relieved at once for the sake of the patient's life. This will be necessary occasionally in the *status epilepticus* of puerperal eclampsia.

Epitome of Treatment

The following is a summary of the line of treatment recommended in a case where the convulsions begin at the time of commencing labour, or at any time before labour is due: Administer a purge; put the woman under chloroform, and rupture or puncture the membranes, according to the degree of expansion of the cervix. Then dilate the cervix with a de Ribes' bag, and assist labour with forceps, doing craniotomy if the child is dead.

If no chloroform can be got, give a hypodermic injection of morphia ($\frac{1}{2}$ gr.) or chloral and bromide by mouth or rectum. If the patient is a suitable case, or if none of the just-mentioned drugs have a sufficient effect, bleed to ten ounces or more.

The treatment of cases in the puerperium, which have either begun then, or are continuations of the eclampsia of labour, must be conducted on ordinary medical principles.

[1] John Phillips, *Obst. Trans.* vol. xxx. p. 354.

CHAPTER LXVII

ACCIDENTAL COMPLICATIONS OF LABOUR AFFECTING THE LIFE OF THE CHILD ONLY

PRESENTATION, PROLAPSE, AND EXPRESSION OF THE UMBILICAL CORD

Definition.—The cord *presents* when it lies in front of the head or presenting part before the membranes are ruptured. It *prolapses* when it falls down and lies in front of the presenting part on rupture of the membranes.

Expression of the cord occurs when it is squeezed out of the uterus between the presenting part and the cervix after the second stage has begun, having presented or not in the first stage.

The cord when prolapsed may lie anywhere in the vagina. It is usually at the side. A loop may appear at the vulva.

Causation and Frequency.—In the normal pelvis the head fits the lower uterine segment sufficiently well to act as a ball-valve, and prevent the passage of fluid, so that the cord is safely retained also, even if it lies quite ready to descend. If, however, the *pelvis is contracted*, the irregularity of outline of the brim allows the cord to descend by the side of the head, which in the various forms of flattened pelvis does not fill the transverse diameter. It is in cases of contracted brim that at least 30 per cent. of all cases occur.

Another cause is found in *malpresentations*, which cause non-adaptation of the presenting part to the brim ; and especially transverse lies, for these also bring the navel, and therefore some length of the cord, close down to the os. Other malpresentations are those of the face and brow ; and prolapse of the arm. These causes are all to be referred back in most instances to contraction of the pelvis. *Excessive length of cord* and *placenta prævia* are occasional causes.

Signs.—The cord is readily felt in the bag of membranes, and still more readily if it is in the vagina. The only thing which could be mistaken for it is a coil of intestine belonging either to the mother or the child. Since the uterus must have ruptured for it to belong to the former, there will not be much difficulty in excluding that origin ; and if it is due to ventral hernia in the child (ectopia viscerum) examination of the presenting part will readily settle that point.

The cord when felt may be pulsating or not. It does not follow that if there is no pulse the child is dead, for the heart's beats may not at the moment reach the loop, owing to some pressure on the cord (by the head) higher up. Or the heart may have stopped beating during a pain. If the cord cannot be so seized as to be examined, the only way to settle the question of the life of the child is to feel fœtal movements, or to hear the fœtal heart. If this is heard it decides the matter ; but if it is not there must be

several unsuccessful trials made before the child is considered dead. If the cord can be well felt and there is no pulse in it for a minute or more, or if it is quite flabby from decomposition, the child is of course dead.

Results.—It is important to remember that the position of the cord does not affect the mother in the least degree, so that on account of prolapse of the cord alone, uncomplicated by contracted pelvis or by some malpresentation, it is not justifiable to place the mother in any risk by manipulations. While the stage is that of presentation there is no danger to the child. It is only after rupture of the membranes that the danger arises; and then the effect of the prolapse depends on the lie of the child to a considerable degree.

In podalic lies prolapse is not of much importance, since the cord is not dangerously pressed on by the soft parts, and only by the head for a minute or two. If, however, the membranes rupture early, there is considerable danger of compression while the os is being dilated by the breech, and afterwards owing to the slow passage of the head.

In transverse lies prolapse *per se* is practically of no importance, for version will have to be performed for the faulty lie, and this will restore the cord.

In cephalic lies there is the most danger, for the cord is exposed to pressure during the descent of the head through the pelvis and lower vagina. The largest proportion of fœtal deaths occur in cases of this lie. The prognosis here depends on (*a*) the cause of the prolapse, (*b*) time at which it occurs, and (*c*) the part of the pelvis in which the cord lies.

(*a*) *Cause.*—In the case of contraction of the brim the cord, if it is restored, will probably come down again, being again *expressed*; and further, the labour cannot be quickly ended. In case of placenta prævia it will probably descend again. The prognosis in these cases is therefore not good for the child.

If the cause is a too long cord, complete restoration may prove permanently effectual; and this will probably also be the case where prolapse has been due to excess of liquor amnii. In transverse lies version at once puts the cord out of the way. In these cases, therefore, as far as the cord is concerned, the prognosis is fairly good.

(*b*) *Time.*—If prolapse occurs early, the cord will have to undergo pressure for a long time, and the less the os is dilated the longer this will be. If the cord is expressed after the os is fully dilated, the child may be born alive if the pelvis is not too contracted to allow of rapid extraction.

(*c*) *Part of Pelvis in which the Cord lies.*—If it is between the head and the pubic bones, the cord is certain to be compressed throughout, and this is true to a less degree if it lies between the head and the promontory. If it lies in an oblique diameter, and especially in a posterior quarter, it may escape any great pressure.

Treatment. *In the Presentation Stage.*—The aim here must be to keep the membranes intact as long as the os is not fully dilated, for during their persistence the child is in no danger. The only treatment admissible now is by the *postural method*, to be immediately described. Vaginal manipulations directed to putting back the cord are useless, because it cannot be

raised to above the equator of the child's head without rupturing the membranes ; and no restoration is of any service unless it is as complete as this. Even if this were done there is no reason why the cord should not prolapse again, for the head is still loose in the lower uterine segment (see p. 105). And most important, there is the risk of rupturing the membranes if any manipulations whatever are practised.

The woman should be placed in the knee-elbow attitude, and kept there for ten minutes or so at a time (see fig. 251, p. 277). This allows the head to fall away from the os, and the cord can then sink into the body of the uterus. In the intervals of the assumption of this attitude she must lie on the side away from that on which the cord descends, so as to still take advantage of the action of gravity,

The fœtal heart must be examined often, for it is just possible that the cord may be compressed before the membranes are ruptured ; though this is unlikely except under the circumstances (cutting off of the fore-waters) described on p. 106. If the fœtal pulse slows, showing that this is so, the membranes must be ruptured at once and the case treated as for prolapse. If the postural method has no result as regards replacement of the cord, it at least keeps the pressure off the cord, and prevents premature rupture of the membranes. If it is successful the cord may still come down again. Therefore the treatment should be maintained until the os is fully dilated or the membranes rupture. When this happens it is possible that the cord may remain up above the zone of head now grasped by the girdle of pressure, and cause no more trouble ; or it may prolapse.

Prolapse.—If the child is dead, the case may, supposing the presentation is normal and there is no other reason for interference, be left to nature. When the child is alive, if the pains are very strong and the passages very dilatable, the case may be left for the moment, after placing the cord in one posterior quarter if possible ; but a careful watch must be kept on the fœtal heart, so that assistance may be given immediately it is necessary. If there is no likelihood of rapid delivery the cord must be replaced or the child must be quickly extracted.

With the exception of the two conditions given below as being suitable for forceps or version an attempt should first be made *to replace the cord.*

Reposition of the Cord.—The woman must be put up into the *knee-elbow position* as before, for the same reasons. The loop of cord is then to be taken between two fingers, and raised above the greatest circumference of the head at the girdle of contact. All the prolapsed part must be passed above this level or the manœuvre will fail. The passage should be effected between the pains, and an anæsthetic may be given if it is required.

Supposing the operation is successful, it must be remembered that the cord may be expressed later on if the cause is a contracted pelvis.

If the cord comes down at once after complete replacement, it is of no use to replace it again, but recourse must be had at once to rapid delivery.

In case the fingers are unable to reach high enough, or if for any other reason the cord cannot be returned by them, some sort of instrument may

be used. Special instruments have been contrived, such as that of Murphy's, which consists of a flexible rod, carrying two half-rings of steel at its end. These can be separated to include the cord, and then approximated, from below. Roberton's consists of a rod of gutta-percha with a hole at one end through which is passed a loop of tape, into which a loop of the cord is passed.

It is, however, easy to improvise one when it is wanted, by taking a *new* catheter, and making a slit opposite its eye, so that a loop of tape can be passed through the eye and the slit (fig. 382), leaving the two ends loose. The loop is then passed over the prolapsed portion of cord, drawn sufficiently tight to prevent the latter from slipping, but not tight enough to arrest the circulation in it, and the end carrying the cord is then passed above the head and left there. The stilet, which has remained in the catheter, is now withdrawn. A piece of whalebone perforated at the end will serve the same purpose. The fingers are the best instrument by far, as no damage is done by them to the uterus or placenta.

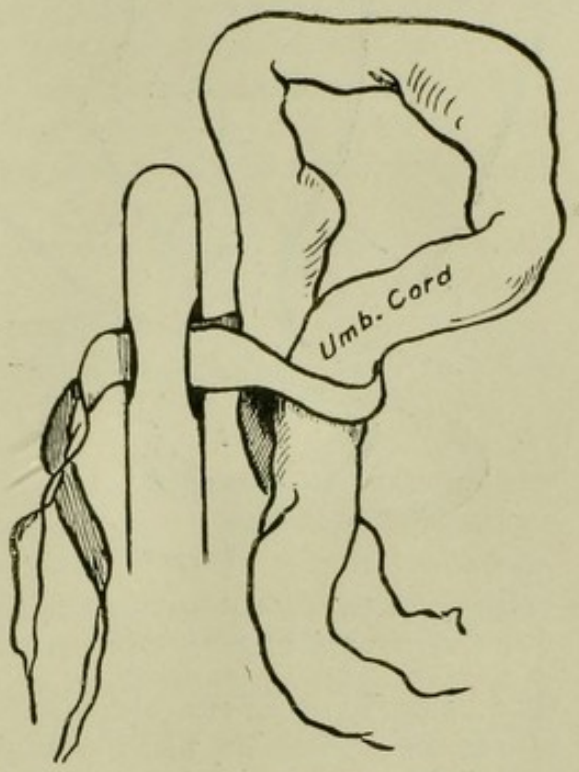

Fig. 382.—Reposition of prolapsed cord by tape and catheter.

The pulse in the cord must all the time be carefully watched, and if any sign of failure of the child appears, speedy delivery must be at once resorted to.

The Forceps must be employed if the passages are sufficiently dilated and rapid delivery is necessary. It is also to be used in cases of expression, under the same conditions of dilatability of the passages, for no attempts at reposition are of any use here.

Version is necessary in any case of contracted brim where the conjugate is not too small to allow of the passage of the after-coming head ; that is, if not less than just over three inches. Version must be done if the os is not sufficiently dilated for the forceps to be employed, and if the head has not become engaged in the pelvis. The cord can be replaced during this manœuvre, and if it seems necessary from the appearance of signs of asphyxia in the child, labour may be hastened by pulling on the leg.

Rupture of the Cord

This accident almost always occurs during precipitate labour, when, if the cord is of the normal length, the child must have fallen some distance, as in the cases where delivery occurs while the woman is standing or at stool. It has, however, been seen when labour took place on a bed, but where the child was shot out of the vagina unexpectedly. It may occur in cases of short cord (see p. 478).

It will not be prevented under circumstances like those first mentioned, even when the placenta is detached at the time ; for if the exit of the child from the vagina is very rapid the curves of the genital canal and the shape of the placenta are sufficient to cause enough resistance.

The site of the tear, as already mentioned in the paragraph on too short cord, is nearly always at or near the navel. It is always irregular, especially in the amnionic sheath, and in consequence of this the bleeding is not very free, unless the vessels are torn at or below the level of the abdominal wall, since the vessels retract to some extent.

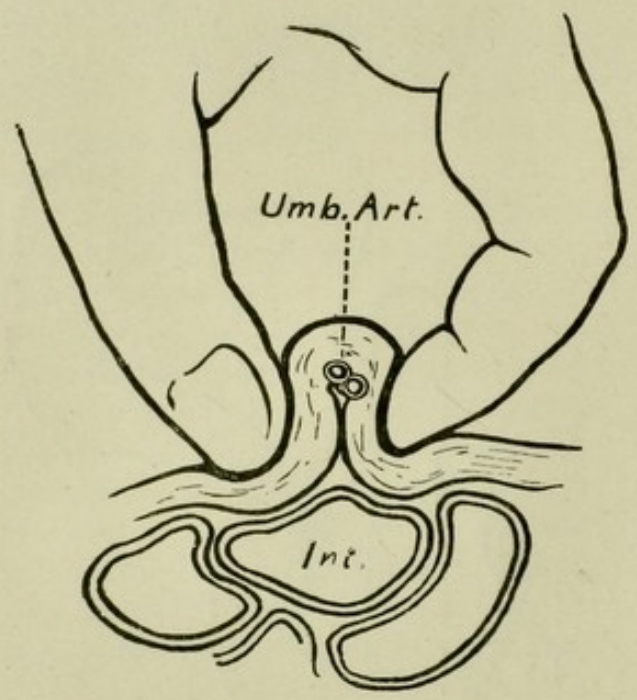

Fig. 383.—Isolation of umbilical vessels by finger and thumb. *Int.* intestine.

The child loses, in addition to the blood which escapes from the umbilical arteries, that which it would have derived from the placenta if rupture had not taken place.

Treatment.—If there is enough cord to tie, or if the bleeding vessels can be secured, this will of course be done ; but if there is not, the only safe way is to pinch up the skin and abdominal wall immediately below the navel, when the cord formed by the umbilical arteries will be felt, and will lie superficial to the pinch of the finger and thumb (fig. 383). The vessels can then be easily under-run with a hare-lip pin or a long needle, without any risk of wounding intestine, which is kept back by the pinch. The needle is then included in a figure of eight ligature, which will take up the navel and secure the umbilical vein as well as the arteries. To apply pads or styptics is waste of time, and will allow the child to lose blood unnecessarily. (See also Hæmorrhage from Navel, p. 584).

Still-birth

Definition.—A child is still-born when it makes no attempt at movement of any kind after birth, including the movements most characteristic of life —those of respiration. It is not a child born dead, though it is true that the term is often applied to a child born dead.

The child is, in fact, in a state of asphyxia, the degrees of which may vary.

An account of the changes in the circulation at the moment of birth, and the reasons why a child takes its first breath, are given on p. 236.

If the stimulus occurs before the child is able to draw air freely into its lungs—while it is in the parturient canal, in fact—inspiratory efforts are made, but even if the mouth is near enough to the vulva to allow of contact with some air, the thorax is too compressed by the walls of the canal to

allow of sufficient expansion. But, as a rule, the attempts are made in breech presentations when there is no air attainable at all, and the centre continues to be stimulated and to cause attempts at respiration until it is exhausted.

The stimulus is, as a rule, two-fold : (1) the contact of the cold air and other irritants with the general skin surface, and (2) the carbonæmia which results when the placental circulation is cut off.

It is found by experiment that carbonæmia is a sufficient stimulus only as long as the medulla is fresh and unexhausted ; but even if it has already been exhausted to some degree, a start can still be brought about by external stimuli. In the stage of complete exhaustion the medulla will not respond even to peripheral stimuli.

Peripheral stimuli can also cause a start in the absence of carbonæmia, and this is what usually occurs in the process of the establishment of pulmonary respiration at birth, where the cold air on the skin acts before there is any great want of oxygen. Still-birth may then be defined as birth with a paralysed respiratory centre, but one not paralysed beyond the limit of at least temporary recovery.

This paralysis may be brought about also by direct damage from pressure, such as may occur in prolonged labour through a narrow pelvis, and here hæmorrhage into the brain-substance is not uncommon ; or the neck may be injured so as to damage the medulla, as, for instance, by forcible extraction in head-last cases.

Causation.—The commonest cause is asphyxia produced by the child's being cut off from the oxygenating maternal blood. This may come about through compression of the cord, as in prolapse ; or in breech cases with delayed birth of the head ; or in coiling of the cord round the child's body ; or it may be due to cessation of the maternal blood supply to the placenta, as in premature detachment of the organ, in death of the mother, in tetanus uteri. In all these cases there will have been attempts at respiration while the child is still in the passages.

Such attempts cause suction of some of the contents of the birth-canal into the child's air-passages, where liquor amnii, mucus, and meconium are sometimes found.

During these attempts a beginning is made of the conversion of placental respiration into pulmonary, and some blood may find its way into the left auricle through the pulmonary artery and veins, and this accounts for the ecchymoses found on the lung-surface in many cases. If the placental circulation is now renewed it may be completely resumed, but little or nothing is known on this point.

Those causes dependent on direct pressure on the child have already been mentioned.

Signs.—Cases of still-birth may be classed into two well-marked and most important divisions : (1) those which are cyanotic (blue stage), and (2) those which are collapsed and pale (white stage). The former class is recoverable without much assistance, and recovery is indeed often spontaneous ; but the latter requires the greatest care, skill and patience, and failure often results even then.

In (1) the blue stage, there still remains reflex excitability of the spinal cord and medulla; the muscular tone is not lost; the heart is beating steadily, though slowly; the child may gasp occasionally, or may breathe regularly for short periods with intervals of apnœa; and the pupils are normally contracted.

In (2) the white stage, or syncope, reflex excitability is lost; the muscular tone is absent; the heart-beats are irregular and feeble; respiration, if it occurs at all, is feeble, and no air enters the lungs; and the pupils are widely dilated.

Treatment.—The aim of this is to establish regular and complete respiration, and to rouse the heart to regular and forcible action.[1]

The following are the means by which it is attempted to carry this out:

1. Removal of foreign bodies and substances from the air-passages.
2. Procuring the patency of the air-passages.
3. Excitation of the circulation.
4. Ventilation of the lungs.

1. *Clearance of the Air-passages.*—This is, of course, essential before respiration can be hoped for, but it is an essential often forgotten.

The mucus that the child is likely to have inspired is to be wiped out of the mouth and fauces with a soft handkerchief; and this cleansing can be more thoroughly done, as recommended by Champneys, by placing the child on its back, with its head hanging over the edge of a table, when the fluids will gravitate into the posterior nares, and then placing a handkerchief over the mouth and nose, and blowing gently through the mouth. The mucus will be expelled into the handkerchief through the nose.

If the passages are still not clear, as shown by the air not entering, a No. 8 or 9 catheter should be passed through the glottis, and gently blown through. If it is passed for about three and a half inches measured from the lips, it will have reached to a point just above the bifurcation of the trachea, and the air forced in at this level will carry all the mucus lying above it up into the mouth. This manœuvre requires a little practice, which can be had on any dead fœtus.

2. *Procuring the patency of the Air-passages.*—This refers especially to the glottis, which in the white cases is collapsed. It is best opened by the catheter passed as above mentioned. It is opened by Schultze's method of artificial respiration, to be described; but this is rather too rough treatment for a child in the 'white' stage.

3. *Excitation of the Circulation*; and 4. *Ventilation of the Lungs.*—These results are both aimed at in one manœuvre, that of artificial respiration. There are many ways of performing this—namely, those of Marshall Hall, of Howard, of Silvester, that of Schultze, and by mouth to mouth insufflation.

Champneys has shown that the first two are useless in the case under consideration, as the chest has no resiliency. *Silvester's method* is as follows: The child is to be placed on its back, with the shoulders raised and supported on a folded cloth; the tongue is to be drawn forward, the child's arms are

[1] See Champneys, 'Some Points in the Practice of Artificial Respiration in cases of Still-birth, &c.' *Int. Journ. of Med Sciences*, 1886, vol. i. p. 455, from which much of this account of treatment is taken.

to be raised upwards by the sides of its head, and then extended upward and forward for a few moments, the arms being everted; they are then turned down and pressed gently and firmly for a few moments against the sides of the chest. During this process the feet should be held.

The disadvantages of this method are that the child is lying on its back, and the supine position impedes the escape of fluid from the air-passages; and that it does not provide for the opening up of the glottis if this is closed.

Schultze's method is: 'The navel-string being tied, the child is seized with both hands by the shoulders in such a way that both thumbs lie on the anterior wall of the thorax, both index fingers extend from behind the shoulders into the axillæ, and the other three fingers of both hands lie obliquely along the posterior wall of the thorax. The head is prevented from falling by the support of the ulnar sides of the two hands. The operator stands with somewhat separated legs, and bends slightly forward, holding the child, as above described, at arm's length, hanging perpendicularly. (*First position, inspiratory.*)

'Without pausing, he swings the child upward from this hanging position at arm's length. When the operator's arms have gone slightly beyond the horizontal, they hold the child so delicately that it is not violently hurled over, but sinks slowly forward and forcibly compresses the abdomen by the weight of its pelvic end. (*First movement, expiratory.*)

'At this moment the whole weight of the child rests on the operator's thumbs lying on the thorax. (*Second position, expiratory.*)

'Any compression of the thorax by the hands of the operator must be carefully avoided. The body of the child rests during the first position with the floor of the axillæ on the index fingers of the operator exclusively, and no compression should be exercised on the thorax in spite of the support of the hands to the head, nor should the thumbs compress the thorax in front. When the child is swung upward the spinal column should not bend in the thoracic, but only in the lumbar region, and the thumbs should not at this time strongly press the thorax, but should only support the body as it sinks slowly forward. The raising of the body as far as the horizontal should be effected by a powerful swing of the arms (of the operator) from the shoulders, but from that point the arms should be raised more and more slowly, and by means of a delicately adjusted movement of the elbow-joints and scapulæ on the thorax, the pelvic end of the child should fall gradually over. By this gradual falling of the child's pelvis over the belly, considerable pressure of the thoracic viscera is exercised, both against the diaphragm and the whole thoracic wall. At this point the inspired fluids often pour copiously from the respiratory openings. After the child has slowly but completely sunk over, the operator again lowers his arms between his separated legs. The child's body is thereby extended with some impetus; the thorax, released from all pressure (the operator's thumbs lying now quite loosely on the anterior walls of the chest), expands by means of its elasticity, but the weight of the body, hanging as it does on the index fingers by the upper limbs, and thus fixing the sternal ends of the ribs, is brought into use for the elevation of the ribs with considerable impetus; moreover, the diaphragm descends by virtue of the impulse which is communicated to the abdominal contents. (*Second movement, inspiratory.*)

'After a pause of a few seconds, in the first inspiratory position, the child is again swung upward into the previous position (*second position, expiratory*), and while it sinks slowly forward, it brings its whole weight to bear on the thumbs, which rest on the anterior thoracic wall, and mechanical expiration again ensues. At this point any inspired fluids always pour copiously from the mouth and nose, and generally meconium from the anus. The proceeding is repeated eight or ten times a minute, but more slowly when the inspired fluids flow from the mouth and nose.'[1]

The advantages of this method are that the child is inverted while in the expiratory position, and the fluids flow from the passages, and that it is found to sometimes make patent the glottis.

Mouth to mouth inflation is performed by laying a handkerchief over the child's mouth and gently breathing through it. The nose is left free, and will act as a safety-valve against rupture of the lung-vesicles. Possibly some of the air may go into the child's stomach, but enough finds its way into the lungs to inflate them, and it can then be expressed from the chest. The disadvantages alleged to belong to this method, beside the one already named, are that the child may be infected by the breath of a tubercular operator, and that the stomach may be so distended as to prevent descent of the diaphragm. The former can of course be avoided by abstention from the operation on the part of tubercular persons, and the second has not been shown to be valid.

The object of *hot bathing* the child is to increase its vitality. Heat, however, in this case has the disadvantage of increasing the tissue waste, and therefore the need of oxygen; so that until the lungs begin to work it is better to avoid plunging the child into hot water.

It is recommended by some to allow a little *blood to run away* from the cord in the blue variety, so as to relieve the heart. The blood in this case will run from the arteries in the cord, and will only lower the general blood-pressure without, as far as can be seen, rendering the opening up of the pulmonary arteries any easier. The fault, moreover, in the cases for which it is recommended, where the child is blue, is not weakness of the heart from overfilling of the right side, for the blood can easily escape into the left side through the foramen ovale, but simply absence of aërating surface; and increase of strength in the heart's action, even if this treatment would secure it, would not in any way make for aëration of the blood. There is the very important reason against blood-letting in this case that young children cannot bear losses of blood, and suffer from it much sooner than do adults.

Now that the most useful methods have been described, the best way of applying them in each kind of asphyxia may be epitomised.

In the *blue variety* the child should be laid on its back, and the mouth and fauces wiped out. Then it may be placed on its chest on the palm of the left hand, and its back rubbed with a cloth. If this does not cause it to make an attempt to breathe, it should next be laid on a table, and its face briskly sprinkled with cold water. Much more effect will be got from sprinkling the face than by cold water applied to the chest. Then, if

[1] Champneys, *ibid.*

necessary, apply Silvester's or Schultze's method of inflation. If this does not at once succeed, begin the series again, and go on till respiration is well established and the child cries, and improves steadily in colour and vigour.

In the *white kind* the look-out is less hopeful. Here the child must not be roughly handled at all, as it is in a condition of collapse as well as of asphyxia, and the life may be shaken out of it by vigorous treatment too soon applied. As long as the heart is beating, however feebly, attempts should be persevered in. If it does not appear to be beating we should satisfy ourselves that it does not beat for a long time before giving the case up. The child must be laid down on its back and its mouth and fauces cleared out; and it is well to catheterise the trachea at once, and inflate the lungs in this way, inflating and compressing the chest alternately for some time. If this is not successful, try Schultze's method. When the child shows any sign of muscular action, treat it as recommended for the blue kind.

In some cases, in spite of prolonged exercise of artificial respiration, the heart gradually acts more and more slowly and irregularly, and then it is not of much use to persevere any longer, since there is probably some damage to the nervous centres which renders recovery hopeless.

In a large number of cases where there has been much difficulty in getting the child to breathe, the whole of the lung does not expand, and in fact there may be only a very small part of one or two lobes that have been ventilated at all. Such children usually die in a few days of atelectasis, or the unexpanded parts may become pneumonic. The child in all cases requires careful watching for some time, and stimulants are often very useful. Great precautions must be taken to keep the surface warm, and the extremities should be wrapped in cotton wool, or the child may be swathed in this material

PATHOLOGY OF THE PUERPERAL PERIOD

General Considerations.—It is usually allowed by those who have written on the subject of the puerperal state that a patient who has been recently delivered is in a physiological condition; but she is said to be in a physiological condition of unstable equilibrium—that is, one which is ready at any moment to be converted into a pathological downfall. It is pointed out that she has many absorbent surfaces, the result of lacerations or abrasions; that one of these surfaces, the placental site, is of a no less diameter than four inches; and that these surfaces are constantly bathed in a fluid, the lochial discharge, which very readily becomes a cultivation-ground for septic organisms.

In addition to this source of danger another is described: the blood is said to be overloaded with waste products, the result of involution of the uterus, and of the absorption which necessarily occurs of the products of degeneration of the uterine muscle.

The former of these two possible sources of ill will no doubt stand good; the interior of the uterus, however, and therefore the placental site, is usually germ-free. The latter source of danger, however, is purely hypothetical, though it is very tempting as a hypothesis. But the resemblance of the state of things present in the puerperal condition, when we may allow that proteid substances are in the blood in slight excess over the normal for a short period, to instances of excess of certain noxious materials in the blood, occurring because the organs which should excrete them are diseased, is obviously a very superficial and quite misleading one.

We have no evidence whatever that the products of involution of the uterus are more harmful than those of digestion. They may even be of use in the establishment of lactation, or in other ways.

Looking at the matter as broadly as possible, the lying-in woman would seem to be in an equally stable physiological state with the non-puerperal one.

Every lying-in woman has a placental site, and all primiparæ have in addition lacerations of the cervix, nearly all of them tears of the vagina and perinæum. And there has been possible infection in a very large number of cases from the contact of an unpurified finger. The wonder would seem to be that septic infection is so rare. Most of us would expect to encounter it if we made similar wounds in the generative organs of a non-puerperal woman without strict antiseptic precautions. But labour and lying-in have

gone on up to quite recent times without particular attention being paid to the principles of even simple cleanliness, and yet the proportion of illness has not been anything like what might have been expected on the hypothesis of unstable equilibrium.

It will be assumed, then, that any explanation of vulnerability depending on a blood-mass overloaded with materials ready to explode into septicæmia is quite unnecessary.

The affections of the puerperal state may, in fact, be considered as ordinary affections attacking a patient in a traumatic condition, the breaches of surface, in cases where such breaches are the portals of infection, being usually in the genital passages but sometimes on the nipples. This statement holds good equally for septic and zymotic diseases, the contagium of the former class obtaining entrance to the system almost exclusively through the breaches of surface, the latter infecting the woman in the same manner as they would if she were not puerperal—erysipelas, for instance, by way of the wounds, or possibly by other channels, and scarlatina through the respiratory or alimentary tracts.

The sooner we lose the idea that the puerperal woman differs in any way which suggests the assumption of a temporary diathesis from a non-puerperal one who has similar breaches of surface, the better we shall understand the true source and entirely extrinsic nature of all her diseases. This will be made clear as each class of disease is discussed. In the meantime, the student will understand that at least all febrile conditions are due to some ferment or another which has been imported from without.

CHAPTER LXVIII

FEVERS

It will have been gathered from the above remarks that there is no such disease as 'puerperal fever,' using the term in the same sense as 'scarlet fever.' There are, however, various fevers which attack puerperal women and they fall into two groups—the Septic and the Specific.

SEPTICÆMIA

When organisms which cause by their presence in the tissues and the blood the symptoms and results known as septicæmia find their way into the system of a lying-in woman, they have their usual effect.

There is a state of things, falling short of actual entry, where certain organisms (which may or may not be those which, when admitted into the blood, cause septicæmia) develop on the *surface* of a wound, in the discharges thereof, or in the decomposing material near at hand, but never penetrate into living tissues. They produce a poison which is absorbed at the surface. This poison gives rise to symptoms somewhat resembling those of the early stages of septicæmia.

To make a distinction between the two conditions, the illness resulting from the absorption of poison alone is called sapræmia (σαπρός = filthy, rotten). The difference between sapræmia and septicæmia is most vital. It is obvious that in the former disease, directly the surface is freed from the poison-producing organisms, no further doses of poison can be absorbed, and the symptoms of illness cease.

About the general nature of septicæmia nothing will be said here. The symptoms and results common to all kinds will be merely indicated when they occur, further description being reserved for those modifications of these symptoms and signs which are due to the special anatomical arrangements of the organs present after labour.

The conditions which govern septic absorption have been described in the chapter dealing with the Management of Labour (p. 180), but may be here presented in a somewhat expanded manner.

Predisposing Causes.—1. Imperfect cleanliness of external parts of generation.

2. Lacerations of the genital tract, especially of the lower part, and breaches of surface on the nipples.

3. Imperfect retraction of the uterus, leading to retention of clots, chorion, or decidua.

4. Morbid adhesions, causing retention of placental fragments, of placentæ succenturiatæ, and of chorion. This is especially liable to occur after abortion (see p. 303).

5. The presence of recent or of old and not completely cured pelvic inflammations (including vaginal).

6. Considerable hæmorrhage at or after labour.

7. A depressed state of mind.

8. Diseased excretory organs, especially diseased kidneys.

Exciting Causes.—1. Direct inoculation by means of dirty, and therefore probably septic, hands or instruments; from the pus of gonorrhœa; from an ecthymatous condition of the child's skin at birth; from skin disease of the mother; from sinuses discharging pus; from decomposing clots in the secretions or adhering to the external parts.

2. Admission of germ-bearing air into the genital passages. This may be the ordinary air of towns, but it is much more likely to cause infection if it is the air of a lying-in ward where there are other puerperal patients, or that of a surgical ward.[1] Foul breath and ozœna from various causes, where they exist in the nurse or medical man, are not at all unlikely to infect the wounded surface.

3. The presence of septic organisms in the blood, due either to absorption from some remote lesion, or co-existing with some specific fever, *e.g.* scarlatina.[2]

4. Cold or shock. Though 'a chill' is often assigned as the cause for pelvic inflammations, it is probably a rare one. It acts, if it acts at all, by

[1] Sewer-gas is dangerous, and it may cause illness (but not, of course, septic infection directly) by inhalation or deglutition; and wounds under such circumstances may become septic.

[2] Watson Cheyne found pus-producing organisms in the blood of scarlatinal patients.

depressing the vitality of the patient temporarily, and so rendering the tissues unable to resist the invasion of organisms in contact with them.

The **Results** of septic absorption are so varied in character that the best way to make them clear will be to divide them into a few fairly well-marked clinical groups, as follows :

1. Cases where there are no local absorption signs such as para- or peri-metritis, but where constitutional symptoms (fever, &c.) are well marked. Cases in this group may be
   - (*a*) Mild, and under this heading, along with slight septicæmia, sapræmia is included ;
   - (*b*) Severe, where the patient dies from the virulence of the poison before any local symptoms declare themselves. Doléris has called this condition *septicémie foudroyante.*

2. Cases where there are lesions in the pelvis or its neighbourhood, as para- or peri-metritis or phlebitis.

3. Cases where acute general peritonitis is the most conspicuous feature.

4. Chronic cases, with metastatic inflammation of joints, and the formation of metastatic abscesses (pyæmia).

Group 1. Cases where there are no Local Signs of Absorption

A. Mild Cases : Sapræmia and Slight Septicæmia [1]

Sapræmia has been alluded to in general terms. It is also called **septic intoxication.**

Causation.—The life-processes of all micro-organisms include among other results the production of new chemical bodies (ptomaines).

In sapræmia the poison absorbed and causing the fever is most likely produced mainly by organisms (saprophytic) which belong to the processes of putrefaction, and not by organisms associated with inflammatory and suppurative processes (pathogenic). The essential factors for the production of sapræmia are : saprophytic organisms (which are universal), dead material in which they can multiply and produce the poison, and a surface at which the poison can be absorbed into the blood. This is simple, and sometimes the whole disease from which a patient suffers may be comprised in such a series of events. Von Franque,[2] however, found *only* streptococci in one clinically typical case of sapræmia, also *only* colon bacilli in another. The dead material is found in the genital passages of a recently delivered woman, and consists of clot, débris of decidua, and the lochial discharges generally, the discharges of non-granulating lacerations and abrasions, the most superficial parts of which are dead, and adherent portions of ovum. It is at freshly denuded surfaces that absorption occurs most frequently, and those which are lowest in the genital canal, and therefore nearest the external air, are most likely to form the channel. The general uterine surface, however, and

[1] Septicæmia and sapræmia probably never exist quite independently of one another. In all cases which are described as being the one or the other, there is probably an element of each present.

[2] *Zeit. für Geb. und Gyn.* 1893, vol. xxv. p. 277.

no doubt most conspicuously the placental site, is capable of acting as an absorbent surface until it is protected by the processes which lead to the renewal of its epithelial lining. In these cases the organisms must have been admitted during or shortly after labour, being carried in on the hands or instruments introduced into the genital passages, or in the air necessarily entering with these foreign bodies. They then find a suitable developing ground in some dead material or other.

But it does not follow in all cases that the poison they produce is absorbed, for healthy granulating surfaces do not readily absorb poison. Patients often have fœtid, and obviously decomposing lochia, without rise of temperature or ill-health of any kind.

It will thus be readily understood that sapræmia is prone to arise in (1) those cases in which obstetric operations have been necessary, or where labour is difficult, owing to pelvic contractions, and bruising of the soft parts has occurred; (2) in cases where lacerations of the vaginal orifice and perinæum are present, and especially therefore in primiparæ.

Symptoms and Course.—The fever which is the only constant symptom present in these cases developes gradually as a rule, and a rigor is an unusual commencement.

The temperature increases by more or less irregular gradations each day (fig. 384), reaching 102° or a little more; and it seldom rises suddenly to 105° or 106°.

Infection hardly ever occurs before labour in this class of case, so that the temperature begins to rise when decomposition with liberation and absorption of the poison occurs; that is about the second or third day, or possibly a day or two later.

The pulse and respiration move upwards in proportion to the temperature.

If large doses of the poison are absorbed, the occasion of absorption may be marked by a rigor; but it is then difficult to make certain that septic infection is not an additional element in the case. Cases of very severe character, however, have been recorded where douching at once succeeded in abolishing the unfavourable symptoms.

Other general febrile conditions: headache, anorexia, and so on, are in proportion to the pyrexia.

Scarlatinoid and measly *rashes* are not uncommon; they are, as a rule, ephemeral.

Lochia.—The lochia in sapræmic cases are fœtid, as a rule, bearing out to some extent the belief that the kind of organism mainly engaged in the production of the disease is a saprophytic one. Boxall has shown, however, that taking all feverish cases together, fever almost invariably precedes fœtor of the lochia.

This may be accounted for either on the supposition that the fever is the result of the presence of both septic and saprophytic organisms, the former producing fever before the latter have rendered the lochia fœtid; or by the fact that ptomaines have been found to be produced in putrefying material before the fœtor is recognisable.[1]

[1] Brieger. *Flügge's Micro-organisms in Disease*, p. 573, New Sydenham Society. He believes that putrefaction probably eventually destroys the ptomaines.

The rise of internal temperature in any case no doubt promotes the growth of the organisms, which in turn, by the accompanying increased production of poison, intensifies the fever. The lochia may be, and in many cases are, rendered fœtid by vaginal decomposition alone, the interior of the uterus being germ-free ; and in such cases the advantage of prompt treatment is obvious.

The lochia, in severe cases, sometimes cease altogether.

Milk.—In mild cases the secretion of milk is unaffected in quantity, though it may disagree with the child. In patients who have continued high temperature the flow often ceases.

The symptoms in cases of true **septicæmia** of a mild character are practically identical with those just described, both in time of appearance

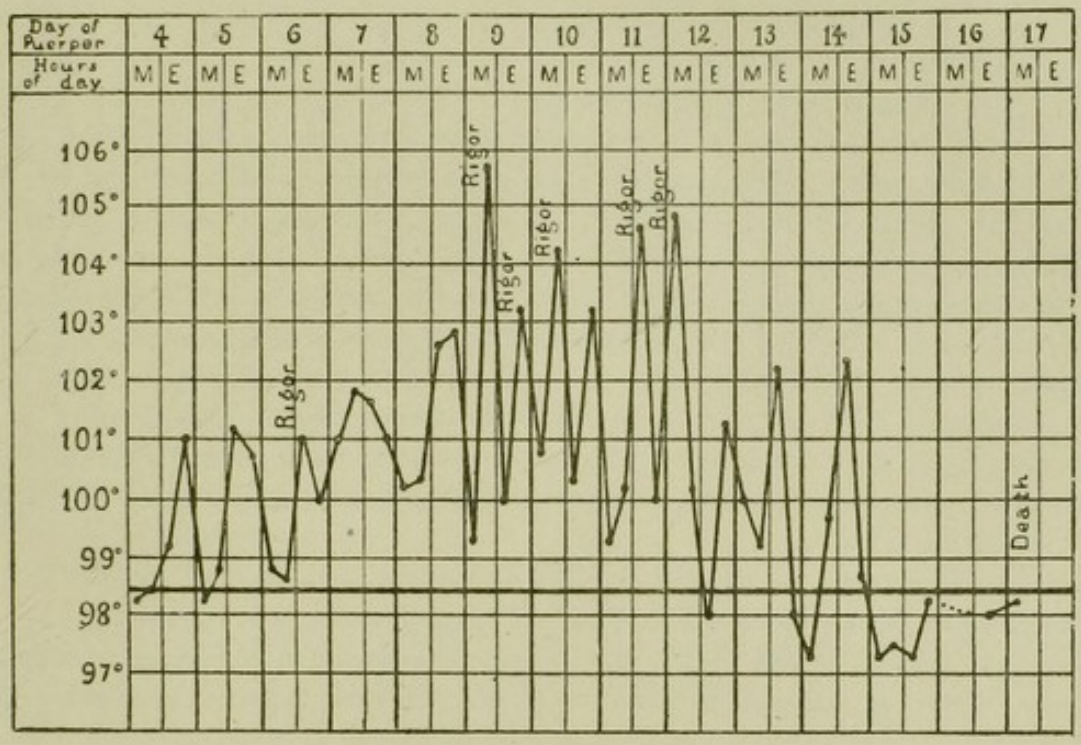

Fig. 384.—Case of puerperal septicæmia ending in death. The average chart of a sapræmic case would resemble this up to about the eighth day as here shown. (This chart begins on the fourth day.)

(probably most constantly on third day), and in progress. In some instances, however, the lochia are never fœtid, showing that no putrefaction is occurring, but that the only organisms at work are pathogenic.

In the foregoing clinical sketch we have a fair type of the effect of fever in general on the lying-in woman. It illustrates the fact that there is no such distinct entity as puerperal fever, but that the symptoms are the same as in a non-puerperal person ; with the addition, that in the two characteristic secretions of this state—namely, the lochia and the milk—there may or may not be modifications.

B. Severe Cases of Septicæmia

These cases, fortunately very rare at the present time, are the result of infection by intensely virulent poison, and usually occur in a patient who is,

by great loss of blood or other powerful depressing causes, or by diseased excretory organs, rendered incapable of resistance to the entry and development of pathogenic organisms.

The severity of the case may be such that the invasion period is reduced to a few hours, and in one or two days the patient is dead ; killed by the profound general alteration in the blood and tissues—before any local signs of inflammation have had time to appear in internal parts.

The rapid development of high fever with severe constitutional symptoms is the main characteristic of this group of cases. The patient has a rigor within a few hours of delivery, or during or before delivery if infection has occurred during or before labour from examinations made with septic fingers —for instance, in a case of placenta prævia—the pulse and temperature quickly rise, the latter often establishing itself at 103° or 104° on the appearance of the rigor, and the pulse which is hurried in proportion (130-160 per minute), though hard and incompressible at first, becomes very soon thready and weak. The skin is bathed in sweat, and the respiration is shallow and rapid Diarrhœa is often troublesome, and is nearly constant, after the first few hours, at all events. The typhoid condition is now developed, and perineal and vaginal tears become sloughy. There may or may not be abdominal tenderness, but there is nearly always distension. The temperature often now declines, and becomes subnormal ; but the pulse, which is therefore the most reliable criterion of any, shows increasing signs of weakness, irregularity, and rapidity. The mental state varies : as a rule, the patient is in no great anxiety about herself, and she suffers no pain. Delirium of a low muttering type may occur at night ; and towards the end drowsiness, deepening into coma, supervenes ; and death occurs on the third or fourth day of the lying-in period.

During this rapid illness the lochia sometimes disappear when the fever developes, and sometimes a bloody discharge persists throughout.

Milk, as a rule, is not secreted. The spleen is often tender and enlarged. Various kinds of rashes, mostly of a scarlatinoid type, may make their appearance.

Post-mortem nothing is found but the signs of acute septic poisoning, namely, changes in the blood, staining of tissues, and softening of parenchymatous organs.

Treatment.—The treatment of all cases in this group should be carried out on the same principles. By removing the microbe-containing matter in the sapræmic cases, the temperature and other symptoms of fever will at once disappear if, by the time treatment is begun, septic organisms have not obtained access to the deeper structures ; and as it is impossible to diagnose at once whether the case is sapræmic or septicæmic, an endeavour must be made to render the interior of the uterus germ free in any case. When the patient appears to be the subject of the more virulent form of the disease the attempt must still be made, for even here marked relief will at once follow this course, if the case has, as is possible, been really one of free absorption of substances of the ptomaine class.

On the temperature in any puerperal woman rising markedly, the condition of the bowels and breasts must be ascertained, and any disorder corrected ; or if the patient has been excited and has a temperature, it should

be made out that there is no real fever (see pp. 562 and 569, for various causes of rise of temperature).

These possibilities having been cleared away as far as may be, and a vaginal douche of 1-2000 corrosive sublimate, if this has not already been employed, having been given, ergot should be administered for twelve hours, ʒiss or ʒij of the tr. ergotæ ammoniat., or inj. ergotin hypoderm., ♏viij—x every four hours, to stimulate the uterus to expel any clots or other decomposing matter. If nothing is expelled, and there is no improvement at the end of this time, the uterus should be explored by the finger, under anæsthesia if necessary, an intra-uterine douche (2 quarts of 1-2000 corrosive sublimate) being given at the same time.[1] Débris and placentæ succenturiatæ are by this means detected and removed. The finger is the safest instrument, the nail being very carefully used. It would be good practice to at once explore the uterus without waiting for the action of ergot, if the case seem at all urgent. If it does not, it is perhaps as well not to alarm and disturb the woman until ergot, used as directed, has proved useless.

The patient often now loses her symptoms, and may convalesce uninterruptedly. Sometimes, however, the temperature rises again after a few hours of subsidence. In this case, or if it never goes down, the uterus should again be douched, and the interior of the uterus may be mopped with pure carbolic acid or iodised phenol, and in these cases carbolic acid must have been used in the douche, and not sublimate.[2]

The patient's strength should be carefully maintained by nourishing food and stimulants, and the bowels made to act freely once or twice. Very large quantities (Von Jaksch) of alcohol have been given in puerperal septicæmia with great advantage.

2. Fever with Lesions in, or in connection with, the Pelvic Organs

This class includes a large number and variety of local manifestations of the presence of organisms in the tissues.

Causation and Pathology.—It must be remembered that there are two ways in which organisms can reach the lymphatic tracts (considering the peritoneum also as a lymphatic space): one, in the way which we have considered hitherto, namely, by breaches of surface, and in this case the connective tissue and structures contained in it are first involved; the other, by extension along the mucous membranes lining the genital canal from the vagina to the abdominal openings of the Fallopian tubes. Those inflammations produced by absorption through the former channel form a Parametritic group; and those by the latter, affecting mainly the peritoneal surfaces of the organs, form what may be called a Perimetritic group.

The structures affected in the former class comprise the substance of the

[1] There is no need to employ instrumental dilatation of the cervix in these cases, for the pressure of the finger is practically always sufficient to enable it to pass the internal os.

[2] The use of the curette recommended by some, has not been always satisfactory. It is probable that under some circumstances, the exposure of a new raw surface by its means may facilitate the absorption of the septic matter already in the uterine cavity.

uterus and its vessels, the connective tissue of the pelvis, and the lymphatics and vessels running in its substance.

Those in the latter are the peritoneum of the pelvis, with the viscera covered by it (whose structure is only superficially affected at first, though later the inflammation may extend deeper), comprising the ovaries and tubes, the part of the rectum covered by peritoneum, and any intestine that may happen to be close at hand.

Parametritic Group.—Absorption of septic poison occurs at some breach of surface in the vagina or the cervix, or at the placental site. It is no doubt most commonly at a laceration of the cervix or the lower part of the vagina. Cellulitis follows. If infection have occurred at the uterine surface, the uterine wall is inflamed to a degree varying from that of simple œdema to that of the production of a breaking-down tissue containing numerous abscesses, these being usually the result of suppuration in the thrombosed sinuses.

Parametritis.—Very marked anatomical disturbance occurs when the connective tissue is widely affected. Free effusion of lymph, nearly always unilateral, takes place into the large tracts of this tissue found in the pelvis. These tracts lie on each side of the uterus, in the broad ligament, especially at their bases at about the level of the cervix; behind in the utero-sacral ligaments; in front between the supra-vaginal portion of the cervix and the bladder, and between the symphysis and the bladder. If, as is most common, the cellulitis is on the left side of the cervix, the base of the broad ligament on that side swells up into a hard mass, filling up that side of the pelvis and depressing the fornix, fixing the uterus and displacing the cervix to the opposite side of the pelvis (fig. 385).

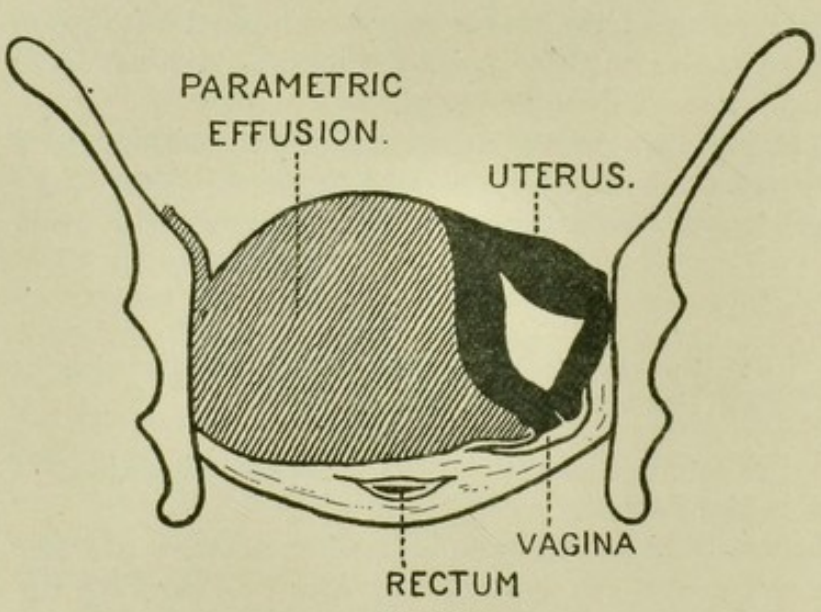

Fig. 385.

The ovary and other structures in the broad ligaments are liable to take part in the inflammatory process. Extension may take place from the broad ligaments to the connective tissue about the psoas muscle, and even along the course of that muscle up to the perinephric fat; or beneath the parietal peritoneum of the abdomen; or sometimes forwards, along the round ligament to the inguinal canal. From the utero-sacral ligaments it may extend so as to surround the rectum, and the anterior parametric variety may spread upwards to the anterior abdominal wall.

The effect of this spreading is sometimes curious and confusing, in that the cellulitis may disappear at its pelvic origin, leaving masses of inflamed

tissue in different parts of the abdomen as just mentioned without anything to account for them. Such cases are instances of *remote parametritis* (fig. 386).[1]

When resolution occurs, the removal of the effused lymph is nearly always complete.

During the process of absorption the contraction common to all resolving inflammatory deposits takes place, and the uterus is found drawn over to the side originally affected (see fig. 386). Displacement of the cervix is most marked in parametritis of the base of the broad ligament (see fig. 385). In an early stage of parametritis the mass pushes the uterus over to the opposite side of the pelvis and the contrast between the position of this organ in the early and late stages of the disease should be remembered, as it may be important from a diagnostic point of view.

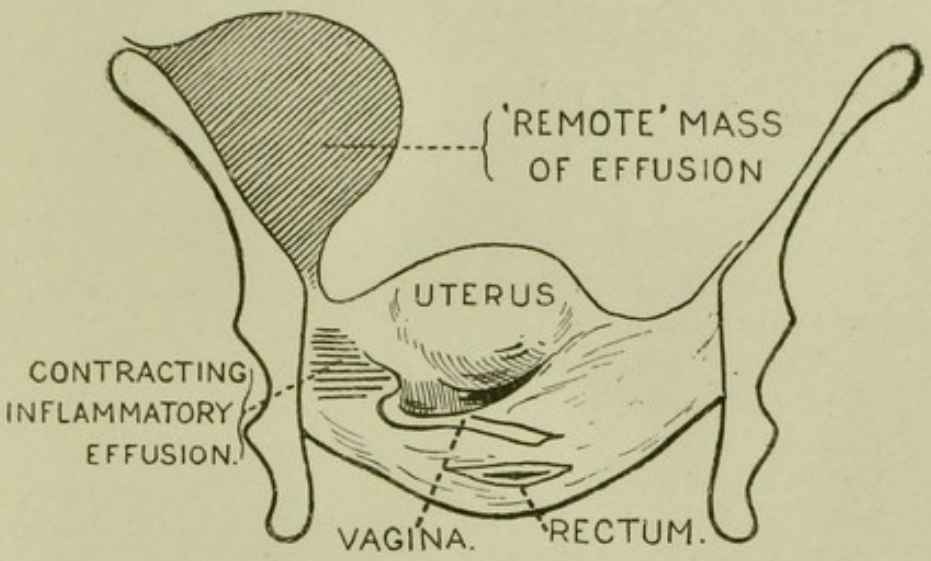

Fig. 386.—Remote parametritis.

Parametritis, instead of undergoing resolution, as is the rule, may suppurate. In such case the abscess, which is occasionally fairly large, opens usually above Poupart's ligament, but sometimes below it; or less commonly into the vagina, rectum, or bladder, or through the sciatic or obturator foramina, according to its position. Abscesses rarely open into the ischio-rectal fossa, their progress in this direction being arrested by the pelvic fascia (see p. 89). The ovary in some cases is converted into an abscess, and it is occasionally found in this state in the midst of merely inflamed connective tissue.

The cellulitic deposits in the case of remote parametritis sometimes suppurate. They usually do so—if it happen at all—some weeks or even months after labour, and when this occurs along the course of the psoas muscles it may cause considerable confusion, the collection of pus being liable to be mistaken for abscess due to caries of the spine or pelvic bones. The hip joint has been found affected and disorganised by ths invasion of pus.

To complete the general account of the changes produced by parametritis, it may be mentioned that in cases where the inflammation extends forwards, affecting the connective tissue in relation with the bladder, marked symptoms—frequency of micturition and pain connected with the filling and emptying of the bladder—are, as a rule, present; and that when the utero-sacral ligaments are involved, the tissue round the rectum has been known to swell up so as to cause temporary occlusion of its lumen.

Phlebitis.—The veins in the broad ligaments, including the uterine vein and the plexuses, ovarian and pampiniform, corresponding to the ovarian

[1] Matthews Duncan, *Clinical Lectures.*

artery, may be invaded by septic organisms, and these may obtain access either at the exposed mouths of the thrombosed sinuses at the placental site, in which the contained clot forms a good cultivation medium, and a path to the interior; or by means of an intense cellulitis in the tissue around the veins, which by damaging the nutrition of their walls, renders them easily penetrable by the organisms now abounding in these tissues. Thrombosis, if not already present, and afterwards possibly suppuration, then occur.

If thrombosis is the only result of the inflammation the affection is commonly limited to the veins immediately round the uterus; but even this condition may advance further, and clotting may spread into the internal iliac, common iliac, external iliac, and femoral veins. It is quite possible that a 'remote' phlebitis analogous to remote peri- or parametritis occurs, the phlebitis extending along to the femoral vein, for instance, and undergoing resolution between this and the uterus, but having caused complete femoral thrombosis, which remains as the most conspicuous result.

There is always in these cases a possibility of detachment of a piece of clot by a sudden movement of the patient, and of embolism occurring in the thorax. There may be infection of the cardiac valves if the endocardium by reason of the blood-changes has its vitality diminished (see p. 540). This infection is obviously most probable when the thrombus in the pelvis is distinctly septic, and when small particles conveying organisms are carried into the general circulation.

As all these complications are in no way special to puerperal cases, the reader is referred to works on surgery in which the subject of Septicæmia in general is treated.

Affections of the lymph vessels have not to be considered separately. As in any other case of cellulitis, the lymph vessels and their origins in the interstices of the connective tissue are found full of organisms as far as the nearest lymphatic glands, which, becoming inflamed, close the road leading to the blood stream. It may be remarked that in some cases the lymph vessels may be seen post-mortem to be distended with pus beneath the peritoneum covering the sides of the uterus.

Perimetritic Affections and Salpingitis.—Inflammation of the tubes and of the peritoneum are taken together, since they are both due, as a rule, to extension of the disease in the same direction.

Septic endometritis, affecting the whole inner surface of the uterus originally, or spreading over it from an infected spot—as, for example, the site of an adherent portion of placenta—extends rapidly to the tubes, damaging to a greater or less extent their mucous membranes. When it has reached the fimbriated ends it causes inflammation of the peritoneal surface of the fimbriæ and of the serous covering of the ovaries. In consequence of this, a quantity of lymph is poured out, which mats the fimbriæ and adjacent parts together and seals up the ostium abdominale. If the affection is acute, and if sufficient pus or infective secretion escapes before the ostium is sealed up, a pelvic peritonitis is set up, which in virulent cases may spread over the whole peritoneal surface. If the infection is not severe to start with, the inflammatory process may (1) be arrested by the sealing up of the tube, and the peritoneum is then protected; or the inflammation may (2) be limited

to the peritoneum in the immediate neighbourhood of the ovary, or to this and Douglas' pouch, by the formation of adhesions which isolate these parts from the general peritoneal cavity.

When the tubal orifice is occluded the tubes often become distended with pus, producing pyosalpinx. This is usually bilateral.

If the surface of the ovary is affected, the whole organ may become involved and converted into a mass of loculi containing pus, or into one large abscess.

Organs in the pelvis, including any loops of small intestine that may be present, are matted together into fairly definite tumours, if the second degree above mentioned be reached. Resolution, as in the case of parametritis, may be the fortunate sequel, or pus may form in the interstices of the organs.

'Remote' perimetritis may occur later, and packets of intestine thus matted together, apparently unconnected with any pelvic lesion, may mislead the observer. The pus in these cases, if it forms, may find its way out through the abdominal walls or through adjacent viscera, as intestine, bladder, or vagina, just as in those instances where it is obviously of pelvic origin.

The so-called 'metastatic' inflammation of the ovaries, the term meaning that inflammation may arise without direct continuity with a septic focus in the uterus, or without septic embolism, probably does not exist, and such cases may be explained as resulting from parametritis.

The peritoneum is always more or less affected in parametritic cases, and the sub-peritoneal connective tissue in a similar way in perimetritis. As a rule, cases where the inflammation is greater in one or other of these structures arise as described, though owing to the free intercommunication between the very numerous lymphatics in the submucous and subperitoneal coats of the uterus, the peritoneum may in virulent cases be directly infected through these vessels.

Symptoms.—(*a*) Parametritis. In typical cases the infection takes place through a laceration made at labour, usually in the cervix. On the second or third day the woman has a rigor, and suffers pain in the pelvis and lower abdomen. She has well-marked fever (fig. 387), and, according to the severity of this, the lochia and milk are affected to a varying degree, as described under Septicæmia. On examination of the abdomen, one or other side of the hypogastrium, usually the left, is found to be very tender, and there may already be some resistance to be made out; or perhaps the abdominal muscles are too rigid to allow of this. In a day or so there is a well-marked mass rising out of the pelvis by the side of the uterus (which organ is of course still three or four inches above the brim), fixed and very tender. On bimanual examination the cervix is found fixed and displaced as already described, and often the mass of effusion has depressed the fornix, and is felt to fill up the affected side of the pelvis entirely. This it easily does, for the space is just now small, and the still enlarged uterus occupies most of the available room. According to the severity of the disease the mass remains for three or four or more weeks, and if under favourable circumstances no change for the better (diminution in size, loss of pain and tenderness, and of fever) occurs in a week, a look out should be kept for evidence of pus-formation.

(*b*) Perimetritis. The mass produced by a perimetritis and the feverish symptoms are later by a day or two in developing themselves than the same

symptoms and signs in cases of parametritis. It is not uncommon for both peri- and parametritis to affect the same patient, and then their relative times of appearance may sometimes be observed. This mass is not so markedly lateral, and it does not displace the uterus so much as that of parametritis; and on vaginal examination it is usually found to lie more in Douglas' pouch, depressing the posterior vaginal fornix, and not the lateral ones at all. The uterus is often felt to be fixed in the midst of an effusion which surrounds rather the middle (in length) of the organ, and which has been well compared to the fixation which would be produced by pouring plaster of Paris into the pelvic peritoneal cavity. It is necessary here, as in parametritis, to remember the size of the uterus at this time, and in case, as often happens, the outline of the organ is quite blurred by the effusion and matting of structures, to allow for this in estimating the amount of perimetritis present

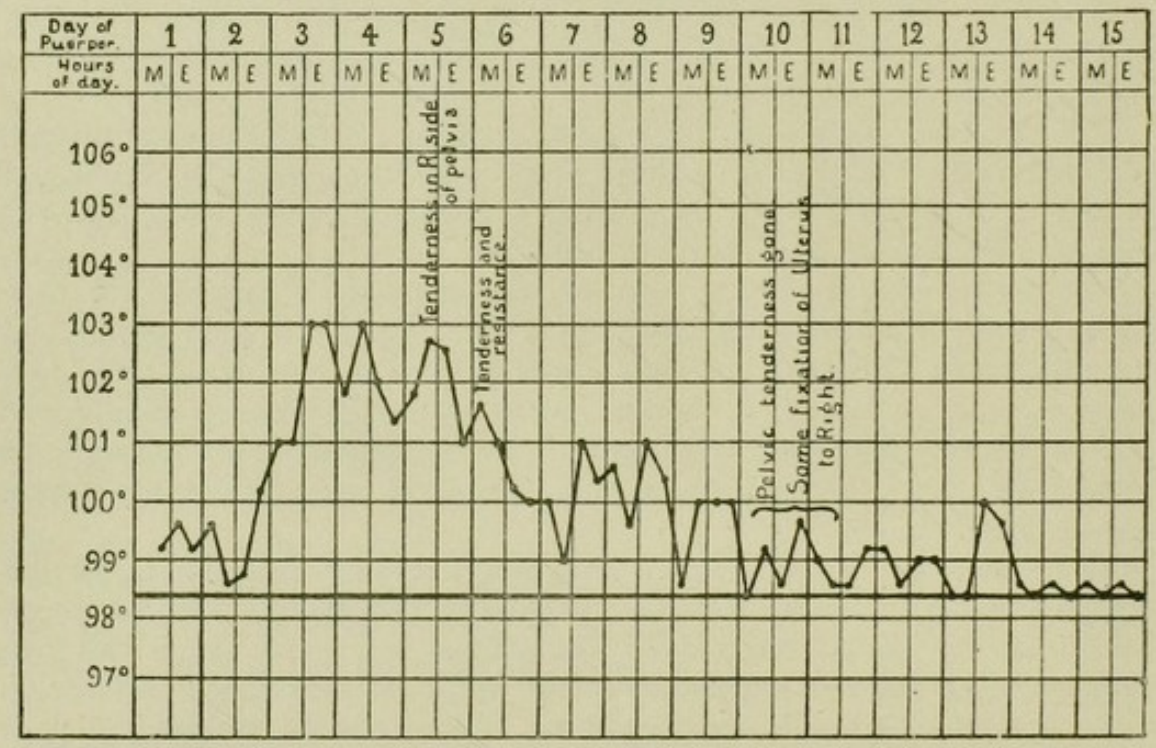

Fig. 387.—Mild case of parametritis.

in any pelvis. The immediate after-history of these cases is very like that of cases of parametritis, but the disappearance of the disease entirely is by no means so probable. Chronic perimetritis is not infrequently left behind, and the woman becomes more or less an invalid, with affections of the tubes or ovaries, which may be many years before they are cured, and which will be liable to again awaken into acute inflammation. The late after-history and treatment belongs to the subject of Diseases of Women.

(*c*) Phlebitis and thrombosis. The recognition of these affections is not easy, even if it is possible. There are some cases, however, where in the absence of any distinct mass in the pelvis, but with some resistance and tenderness on one side or the other, the woman's temperature continues to remain high for some time, and one is led to suspect that something of this kind is causing the protracted septic symptoms. If at the end of a fortnight thrombosis of the femoral vein, or phlegmasia dolens, occur, such a diagnosis

may be considered as justified; as it certainly may if any signs of septic embolism occur in the lungs, or septic infection of the cardiac valves.

Treatment.—The treatment of this group of cases is to be directed mainly to keeping the patient's strength well supported, ensuring absolute rest, and obtaining free action of the bowels if the septicæmic condition is not too severe. If the patient is very septic, diarrhœa is sometimes a troublesome symptom. Morphia should be given if there is severe pain, and hot fomentations are useful in most cases. Where there is evidence—in recurring rigors and in the temperature always keeping somewhat above the normal and occasionally making irregular and considerable rises—that pus is forming (as in chart, fig. 384), a look-out should be kept for the signs of its approach to the surface of the abdomen or towards the vagina, and a careful bi-manual examination of the pelvis made. Long persistence of swellings while the patient is under favourable conditions for their resolution is, as already mentioned, suggestive of pus-formation; but this is not always reliable. Such tumours are often observed not to alter in character for one or two weeks, and still to disappear completely, if parametric, after they have once fairly begun to do so.

When an abscess points, the natural course is to open it at once. Matthews Duncan seems to have doubted the wisdom of this proceeding, because in some cases he found that there was considerable hæmorrhage from the interior of the abscess so opened. This hæmorrhage, which was enough to weaken an already enfeebled patient in some cases, he considers would not occur if the abscess were allowed to burst spontaneously. Since this complication might in any case probably be obviated by lightly plugging the cavity with iodoform or some other antiseptic gauze, it may be fairly stated that the best treatment is to evacuate and thoroughly drain any abscess that is near the surface.

Where an abscess has been diagnosed, or is strongly suspected to exist at some depth in the pelvic cavity, the question of making an exploratory abdominal incision will have to be considered.

The procedure in such cases is to find the pus-containing cavity, evacuate it with an aspirator, and then stitch the edges of the cavity to the wound, ensuring thorough drainage by means of a tube in gauze packing. The abscess may be a pyosalpinx (Cullingworth says nearly always, and that therefore it is nearly always able to be removed), and this admits of more complete treatment. In some cases the evacuation should be done per vaginam, especially if there is distinct bulging there.

The great difficulty is to make the diagnosis. This is not the place to enter into the very large question of how to deal with cases of suspected suppuration in the pelvis. It may, however, be laid down as a general rule that in any case where operation is considered necessary, and the nature and relations of the swelling in the abdomen are not clear, and there is no certain evidence, such as œdema and pointing, of the path to the tumour being shut off from the general peritoneal cavity, the incision should be made in the middle line of the abdominal wall, and the relation of the viscera to the suspected abscess clearly made out before an attempt at evacuation is made.

After the acute stage of pelvic inflammation has passed, the best treat-

ment is to give iron in some form, with or without mercury, or iodide of potassium as an absorbent, and to apply tr. or lin. iodi to the surface over the site of the inflammatory mass, or to blister the same region. During this period the bowels should be kept freely open by saline aperients, and rest in bed enforced.

3. Cases where Acute General Peritonitis is the most marked Symptom

These cases form a sufficiently important clinical group to entitle them to a separate consideration. Local peritonitis is a regular accompaniment of cases in Group 2, even when it is not the main disease; and general peritonitis of a sub-acute or mild kind, and sometimes that coming within the definition of acute, may occur in connection with established suppurative pelvic disease, or in cases of pyosalpinx where, from some cause producing further extension of inflammation into the peritoneum, the fresh attack of inflammation affects the tissues around the tubes and allows the organisms to reach the general serous cavity.

The acutest form of peritonitis, such as is dealt with here, is far more fatal than any of these, and recovery from a well-marked attack is distinctly rare. It is, in fact, the commonest form of puerperal septicæmia which proves fatal.

Pathology.—The septic matter no doubt reaches the peritoneum through the lymphatics running between the site of inoculation and the serous covering of the uterus or the broad ligaments, for the symptoms make their appearance too early for the infection to have spread through the tubes, and inflammation spreading through tubes is usually at once limited.

The whole or a great part of the peritoneal surface becomes affected, and, if there is time, coils of intestine or other viscera cohere firmly and are glued to the abdominal walls, pus forming a little later. In very acute cases there is little adhesion, except here and there, but the surface of the intestines is covered with ragged yellow lymph in parts, and in parts is intensely congested. The coils of intestine are bathed in sero-purulent fluid, and collections of this are found in Douglas' pouch and other available spaces.

In cases rather less virulent than these last, the septic inflammation has time to spread to the pleura and pericardium, which it reaches by the lymphatics which run between the large serous cavities. The surface of the viscera and the fluid are crowded with septic organisms.

Symptoms.—These are of a markedly septic type. There is always a severe rigor, which appears about the second or third day after delivery. The temperature suddenly rises to 103°–105° F., the abdomen becomes distended, and the patient usually has intense abdominal pain, which spreads from the hypogastric region. This pain may disappear later, or may even never exist. The pulse is hard and typically peritonitic at first, but may soon become small and irregular, being rapid all the time (120–160); and the temperature often falls to sub-normal. Vomiting is always present, becoming bilious after a few hours if it is severe. There is obstinate constipation, except just at the end, when it is usually replaced by diarrhœa.

The patient very soon falls into the typhoid state, with a dusky skin, profuse perspiration, inability to lie up on the pillow, sordes on the lips and tongue, and a still weaker and more irregular pulse. She has lost her abdominal pain before the last stage, but never the distension, and now becomes comatose and dies.

In very rare cases the patient recovers from general peritonitis. If this is to happen, the symptoms do not run their course so rapidly, and the typhoid state is established slightly, if at all. The pulse is the best indication of the probable result. This improves slowly, or its strength is at all events maintained. The vomiting ceases, the intestines expel their contained flatus, and distension is diminished. The lochia and milk behave as in severe cases of pure septicæmia; the former being suppressed as a rule, and often, though not always, being offensive when present, the latter secretion never being established.

Treatment.—Treatment is nearly always of little avail as far as a cure is concerned, and attention must be directed mainly to the alleviation of pain and discomfort. Inasmuch as these cases do sometimes recover, it is the duty of the physician to neglect no chance; and therefore the uterus and vagina should be explored for retained substances, and well irrigated with a hot 1–1,000 solution of sublimate, or carbolic acid 1–30, the moment the above symptoms appear.

On the same principle—namely, that of neglecting no chance for the woman—abdominal section and cleansing the peritoneum have been recommended. It is possible that if the peritoneum is washed out quite early and drained, the patient's life may be saved. On the other hand, seeing how rapidly septic organisms develop in a favourable medium, and that infection has arrived through the uterine walls, which are not removed by this means, the chance of benefit arising in the large majority of cases where operation is undertaken is very small. At the beginning it is hoped that the infection is not going to be severe; and later on the favourable moment may have passed.

The case differs from those where septic infection and peritonitis have occurred from direct contamination of the peritoneum, or after abdominal section—when it has been found that washing out the peritoneum, opening the intestines freely and allowing the contents to escape, and afterwards sewing them up again, has been often followed by good results[1]—in that the infective process does not begin in, and is not so strictly limited to peritoneum; for the uterine walls are in most cases crowded with organisms and full of septic foci, which cannot be got rid of. Removal of the septic corpus uteri has been performed with success in instances of this kind; and if an operation is undertaken such entire removal must be its logical completion.

Purgation is a valuable measure in such cases of peritonitis, if only the bowels can be got to act. Their muscular walls are as a rule paralysed, as evidenced by the tympanites; but if saline or other aperients will rouse them into activity they furnish a means of getting rid of some of the poisoned fluid in the abdominal cavity. Since there is in these cases no primary disease of the alimentary canal, and therefore no necessity for absolute rest for that part, there is no reason why it should not be utilised as a drain. Treves has

[1] Lockwood, *Med. Chir. Trans.* 1894.

shown that cases of peritonitis where there is diarrhœa are less fatal than those where there is constipation.

If the vomiting is very troublesome and copious, great relief is afforded by washing out the stomach with warm water; or short of this, by giving the woman large quantities of warm water, half a pint at a time, once or twice. The patient will then vomit with greater ease, and the stomach will for a time be cleansed.

Alleviation of pain may be obtained by hot fomentations and morphia injections. The latter must be discontinued on the appearance of collapse, which is best shown by the pulse. A long rectal tube may be carefully passed to allow the flatus to escape; and if this happens freely great relief is given. It very seldom does, however. Turpentine enemata are occasionally useful to the same end.

The woman does not suffer from pyrexia, and so quinine and other antipyretics are of no use.

She may have large doses of alcohol, given in frequent doses; and this is a most useful drug, as it enables the patient, if she has the least chance, to tide over the period of vital depression. Subcutaneous injections of strychnine, and also of digitaline and atropine, have been by some found valuable means to this end, and may be advantageously combined with the alcoholic treatment. The extremities should be kept very warm.

The injection of antistreptococcic serum is yet on its trial in septic cases. Doses of ten, fifteen, or twenty cubic centimetres are employed on consecutive days. This treatment has its dangers, but in such desperate circumstances as the above, as well as in severe cases of septicæmia, it should not be omitted.

4. Cases where Metastatic Inflammations Occur. Pyæmia

No attempt at detail will be made in reference to these cases, as they differ in no way from instances of surgical pyæmia.

The septic focus is most often a thrombus at the placental site or somewhere in one or in several of the venous plexuses around the uterus. From this point infective emboli are distributed by the blood current to the various small branches and capillaries in the course of the general circulation.

In cases where the *cardiac valves* are already affected by previous endocarditis, the organisms find a resting-place in the irregularities on their surface; or, if the epithelium is intact, may act on it so as to destroy its protective power, and a fresh attack of endocarditis of an ulcerative kind is produced in the right heart. Want of resisting power on the part of the endocardium may be due also to nutritive changes that have recently occurred in connection with the blood deterioration during the present attack of septicæmia.

The pericardium and cardiac muscle may be affected as in any kind of septicæmia.

Septic emboli travelling from the venous side enter capillaries for the first time in the *lungs*, and here if anywhere miliary or larger abscesses resulting from their deposition are found. The *pleura* is also affected by such embolism; but pleurisy may arise by extension from the peritoneum.

In the further course of the circulation those emboli which have not been arrested by the lung capillaries, or emboli arising afresh from suppurating foci in the lung, cause septic embolism in other organs. The *spleen*, softened in any case of acute septicæmia, often contains infarcts, as do the *kidneys* and, more rarely, the *liver*.

The *joints* especially, but also the *intestines*, *muscles*, and *nervous centres*, are liable to invasion.

Treatment.—The symptoms and treatment of this class of case differ in no respect from those of ordinary surgical pyæmia.

CHAPTER LXIX

LOCAL SPECIFIC INFLAMMATIONS

GONORRHŒA. ERYSIPELAS

THESE two diseases may be considered in one chapter, for, although they have no pathological connection, their effects on the lying-in woman are exerted in a somewhat analogous way; that is, they are both diseases which affect only—or at all events, in the first place only—the superficial parts of the body, whether involving cutaneous or mucous surfaces. By doing this they render easy the entrance of septic organisms, which can then invade the deep tissues and multiply in them.

Gonorrhœa.—This disease is often spoken of as a vaginal affection, but in all probability the vaginal epithelium is a less constant situation for the development of the gonococcus than that of the cervix or that covering the vulva and lining the urethra and the vulvar glands and ducts.

In the cervix it appears that gonorrhœa may remain chronic for an indefinite time, being liable to be awakened into activity by such a cause as parturition, and then to spread up into the uterus and beyond.

In the acute condition the gonococcus may be obtained, and pure cultivations may be made, which, after many generations (twenty, according to Bumm), will produce typical gonorrhœa when inoculated on the urethra or conjunctiva. (The gonococcus (a diplococcus) resembles closely in appearance another organism—micrococcus subflavus—which is found in the lochia and vaginal secretions and in other situations. It is distinguished by certain differences in staining, and by cultivation and inoculation experiments.)

In the chronic stages the gonococcus cannot as a rule be discovered, and the organism must be existing in a spore state.

The form of gonorrhœa which causes febrile disturbances in the lying-in woman is usually the re-awakened disease, though acute gonorrhœa may be present. The affection spreads up through the uterus into the tubes, and then into the peritoneal cavity; or if it has already reached the peritoneum in the course of the disease previous to labour, and has given rise to tubal, ovarian, or perimetric inflammation, these inflammations are again aroused

into activity by the stretching and compression of the tissues during labour. In practically no case does the specific inflammation spread beyond the pelvic peritoneum on to that of the general abdominal cavity. The specific organisms are found not to flourish in peritoneal endothelium.

During the existence of gonorrhœa in the genital tract, however, a quantity of pus is produced, and septic organisms swarm in this and in the parts affected; so there is no difficulty, if the path into the peritoneum is not blocked by sealing of the fimbriated ends of the tubes, in the way of the spread of septic processes to any degree, the case then becoming one of septic perimetritis. Adhesive peritonitis does as a rule limit the affection to the immediate neighbourhood of the tubes, but extension may occur by the rupture of a pyosalpinx or other collection of septic fluid.

The ovaries are not uncommonly affected in the lying-in period, perhaps more frequently than in the unimpregnated state, and one or more abscesses may form in their substance.

The type of fever produced by gonorrhæa during the puerperium is thus seen to be perimetric, and its symptoms and characters are those already described in this connection. In very rare cases general peritonitis of septic character may be led on to in the way above described (p. 537).[1]

The prophylaxis has been detailed on p. 226 ('Douching'), and the treatment is that of perimetritis due to ordinary septic causes.

Erysipelas.—This really superficial disease has by many authors been considered as one of the kinds of severe puerperal fever. In erysipelas, as strictly defined by many authorities, however, the invasion by its specific coccus (S. erysipelatosus) of deeper tissues than those immediately underlying the skin is unknown. Erysipelas does of course occur in lying-in women, since there are wounds at which inoculation can easily take place.

When this happens the disease spreads over the skin in the usual way, causing a certain amount of fever, but it does not, according to the above view, reach deeper parts. Any deeper spread of inflammation is due to Strep. or Staph. pyogenes, the organisms being inoculated on the part, either at the same time as the erysipelas organism, or finding an easy path through tissues which are rendered non-resistant by the action of S. erysipelatosus. Cases of so-called 'internal erysipelas' are therefore entirely conjectural, and in our present lights improbable.

The occurrence of an erythematous rash in connection with symptoms of septicæmia cannot be considered as showing that the internal inflammation

[1] Gonorrhœa is probably a far commoner cause of puerperal inflammations than has been supposed (Krönig, *C. für G.* 1893, p. 157). Noeggerath, in 1872, came to the conclusion that of any hundred women who marry men who have been the subject of gonorrhœa at any time during their lives, ninety are affected by gonorrhœa in some form. These numbers are no doubt very excessive, and have been shown to be so by recent investigations. Sänger of Leipzig, in 1886, found that per 100 pregnant women (private and hospital patients) 25 had a purulent discharge, and 10 infected their children with ophthalmia, this last event being considered by him pathognomic of gonorrhœa.

If a degree of frequency anything like these figures is accepted, gonorrhœa must have but little influence in producing fever, as in 900 cases of labour recorded by Mermann (*C. f. Gyn.* 1893, p. 177) no vaginal disinfection of any kind was employed, and only 6 per cent. had any fever at all (also Leopold, *Arch. f. Gyn.* 1891, Bd. xl. p. 439).

found is due to erysipelas, for rashes (pp. 528, 530) are not uncommon in septicæmia.

The coccus of erysipelas is quite indistinguishable by its appearance from S. pyogenes, and is only shown to be a different species by cultivation experiments.[1]

The incubation period of erysipelas is from 15 to 60 hours (Fehleisen) when inoculated. Patients infected during parturition develop the symptoms during the first three days, and after a corresponding interval in cases where infection has occurred later. The rash usually appears first on the genitals, but sometimes on the face or the breast. It has naturally the worst prognosis if it begins on the genitals, for if erysipelas has been inoculated it is not improbable that other organisms have found entrance, or that they will be able to flourish in the same spot later.

The spread of the disease is that usual to it under ordinary circumstances, namely, over the cutaneous or mucous surfaces in the neighbourhood of inoculation, the extent of area involved depending on the patient's power of resistance.

There are the usual constitutional symptoms ; and, since simultaneously or soon after there may be a septic infection, the symptoms of graver character belonging to the latter may at once or very soon become so prominent as to swamp those of the erysipelas.

Prognosis.—In the case of erysipelas attacking the face or other part of the body remote from the genital organs, the prognosis, if antiseptic precautions are carefully observed, is no worse than if a non-puerperal woman were affected, as without doubt the disease can be prevented by these precautions from reaching the wounded surfaces on the part in question. When the genitals themselves are the seat of inoculation the prognosis is more serious, for reasons already given.

Treatment.—In facial erysipelas the usual local and constitutional measures are to be had recourse to. Iron given in the form of the perchloride, quinine, and alcohol are most useful ; and astringents and antiseptics, such as a 1-1000 solution of hyd. perchlor., which combines both of these properties, may be applied locally. If the genitals are the starting-point the most complete disinfection of the vagina and cervix possible must at once be carried out, special attention being paid to wounds or broken surfaces. After this, systematic irrigation with a 1-2000 solution of sublimate or some other reliable antiseptic must be employed, twice or three times daily. A douche of the same kind should be used as an indispensable prophylactic, when erysipelas occurs in any part of the body of a parturient or lying-in woman.

A careful watch must be kept for any need for treating septic intra-uterine conditions, as evidenced by an increase of lochial discharge, and the presence of more blood in it, or by a suppression of the lochia. The odour

[1] It is considered by many bacteriologists that the S. erysipelatosus of Fehleisen is only a form of S. pyogenes, modified by circumstances. As evidence against this view are the experiments of Fehleisen himself, and the opinion of Klein, quoted by Herman ('The Etiology of Puerperal Fever,' *Public Health*, vol. vi. No. 9, p. 282). Herman gives many clinical reasons for considering erysipelas a truly surface disease, and one which, when affecting even the vulva of a parturient woman, does not necessarily lead to internal inflammation (see also a case reported by C. M. Phillips, *Brit. Med. Jour.* 1894, ii. p. 13)

of the discharges is of no use as a guide in this case, since they are already foul from the vaginal inflammation, or at all events this cause cannot be excluded.

Great care must be taken to keep up the patient's strength.

CHAPTER LXX

GENERAL SPECIFIC FEVERS

Scarlatina, Small-Pox, and others

Of these the most important by far is scarlatina, and this will be first considered.

Scarlatina.—The exact relation between pregnant, parturient, and lying-in women on the one hand, and scarlatina on the other, has been in the past, and is still in the minds of some, a matter of uncertainty.

It has been supposed that scarlatina, when it infects breeding women, may in some cases have its nature so profoundly altered that it gives no evidence of its existence, except by producing such effects as in non-puerperal women are only considered as bye-products, or sequelæ of scarlatina. That is to say, in breeding women scarlatina has been supposed to appear in a kind of allotropic modification, and to produce only such symptoms in the woman as belong to common septic processes. It is said further that a patient thus affected may communicate true scarlatina to others.

Such a way of looking at the disease in this connection must at the present day be considerably modified, and a simpler description given.

We are now able to say that the scarlatina of puerperal women differs in no way from ordinary scarlatina. It has a certain influence on the puerperal processes, but is entirely uninfluenced in character by the puerperal state. It will be as well first to compare the arguments used by those who hold the belief in the modifying influence of labour and lying-in with the facts in support of the contrary belief that scarlatina retains its main characters under all circumstances. We shall then have a clear notion of what disease is meant by the term scarlatina.

The former (modification) theory is based on the fact that in a number of instances patients who had been exposed to the contagion of scarlatina had suffered from septicæmic symptoms, in most cases with a fatal result. In one or two of them the children or the husband had at the same time as the woman, or very soon afterwards, well-marked scarlatina.

Such cases are recorded by Dr. Braxton Hicks.[1] He comes to the conclusion that scarlatina is the cause of a large number of the severe cases of fever in the lying-in woman, about half of such number having most of the scarlatinal symptoms, and the other half having only symptoms of blood-poisoning.

[1] *Obst. Trans.* vol. xii. 1871.

Against his view it may be said that exposure to scarlatina does not necessarily mean infection, since there is no proof that lying-in women are more susceptible to scarlatinal infection than other people ; and recent statements of experiences show that they are not. It is to be remembered, too, that though a lying-in woman may not take the disease herself, she may act as a vehicle of contagium between an infected person and another ; and this will account for some cases, otherwise obscure, where scarlatina has been handed on by a woman who suffered from septicæmia to her immediate relatives or even to the medical man.

Scarlatina, when established, does not exclude independent septic infection, which may take place at the same time as the scarlatina ; in fact, the increased temperature due to the invasion of the former, and the diminished power of resistance in the tissues of the feverish woman, would tend to favour the growth of the septic organisms.

Further, septic processes often arise in children's throats in connection with scarlatina. They may therefore be reasonably expected in recently delivered women, who have large absorbent surfaces, if septic organisms are allowed to reach these surfaces,

In the cases of Braxton Hicks there is no exclusion of possible septic infection from without ; antiseptic rules were not observed at the time they happened.

Streptococci are frequently present in the blood of simple scarlatinal cases (Watson Cheyne), and these microbes will very probably find a favourable soil in the damaged tissues of the genital tract. This fact renders unnecessary the suggestion that scarlatina when inoculated at a wound runs a course resembling septicæmia rather than its own usual one : this theory has only been brought forward on purpose to account for the seeming variety in type. For, since streptococci are not found in the normal blood, they must have got into it by inoculation at the same time or thereabouts as the scarlatinal poison, and in all probability at the same place. Now in the cases examined by Cheyne this place of inoculation was not the genital tract.

In an outbreak of scarlatina described by Boxall, where the cases were treated with the strictest antiseptic precautions, there was no instance of pelvic inflammation, nor was there any increase in the temperature of the other puerperal women in hospital at the same time as the scarlatinal cases. That is, scarlatinal infection resulted in scarlatina and nothing else.[1]

Meyer of Copenhagen has reported a quite identical (from this point of view) series of cases in the lying-in hospital of that city ; and Matthews Duncan had shown some time ago that there is no increase of puerperal febrile conditions during epidemics of scarlatina.

The conclusion at which we must arrive is that when a pregnant or parturient woman is infected with scarlatina, she has scarlatina and nothing else as the result. She may have septicæmia as well, but this must be from quite an independent source. The ways in which septicæmia may infect, and show itself in, a scarlatinal lying-in woman have just been indicated.

[1] 'Scarlatina during Pregnancy and in the Puerperal State,' *Obst. Trans.* vol. xxx. 1888, pp. 11, 126, and 167.

The fact that cases may occur (in non-puerperal patients) in which there is little or no rash, and no marked sore throat, does not affect this conclusion, for such cases are extremely rare: such cases may be one explanation of the transmission of the disease by seemingly non-scarlatinal women to their children.

It is quite true that the suggestion alluded to above, namely, that the supposititious septicæmic modifications of scarlatina result from infection at a wounded surface is not contradictory of Boxall's and Meyer's account (that there are no local signs when the genitals are kept aseptic), but it is now seen that there is no need for such a very unlikely explanation.

We may now, regarding scarlatina as a disease of regular type, and not as one having allotropic modifications, so to speak, consider its effects on pregnancy, labour, and lying-in, in turn; first of all giving a general account of the exanthem as it affects a breeding woman.

Symptoms and Progress.—The disease most frequently makes its appearance during the first week of lying-in. It does so rarely before labour. This seems to mean that a woman is more susceptible to the poison during or shortly after labour than at any other time. Such a woman may have been exposed to contagion some days or weeks before labour, and may have had the organisms in her garments, or 'about her,' to use an indefinite but convenient term, without their having been able to establish themselves in her tissues. And here it must be again pointed out that the moment of possible infection is by no means necessarily identical with the moment of actual infection, and any argument containing this fallacy is invalid.

Probably owing to the exhaustion and therefore diminished power of resistance of the recently delivered woman the contagium is able to get a footing. It is far less likely that inoculation takes place at the newly made raw surfaces; since, although it is a possible explanation, there is no proof of this, and no necessity for such an assumption.

The woman, infected at labour, or shortly before it, goes through the ordinary incubation-period, and, hardly ever later than the fourth or the fifth day at the outside, has the first symptoms of the disease. These are not essentially different from the ordinary ones, but may be occasionally somewhat modified.

The *sore throat* seems to be less severe; the *rash*, in accordance with the well-established fact that scarlatinal rashes always attack the warmest surfaces first or exclusively, appears mostly on the lower part of the trunk and the thighs, and is usually more generally distributed than in non-puerperal cases. In many instances it appears and spreads more rapidly than usual.

In the other signs and symptoms there are practically no modifications; albuminuria is perhaps more constant than in non-puerperal cases.

If the disease be not complicated with septic infection it may be mild or dangerous. Cases have been recorded in series of each kind; but, according to the experience of most observers, uncomplicated attacks are usually mild.

Scarlatina occurring during *pregnancy*, if invasion takes place in the last week or so, may precipitate labour by a few days. This statement is difficult to prove, but it is supported by the fact that menstruation is in some cases anticipated when infection has happened shortly before the menses are due.[1]

[1] Boxall: *loc. cit.*

Labour, when it takes place after scarlatina is already in progress, is apt to be delayed by uterine inertia ; and the same cause tends to post-partum hæmorrhage.

In the *puerperium*, the only departures from the ordinary course are that the lochia are often increased in quantity at the time of invasion ; and subsequently they may be arrested, as is usual in fever of any kind ; and that the milk is diminished in quantity, or its secretion entirely arrested, just for the same reason.

The New-born Child.—If the mother has been infected during the last weeks of pregnancy, the fœtus may or may not be infected in utero. Supposing it is, the disease appears soon after birth.

When the mother is attacked by the disease very shortly before labour the child is not so likely to have any symptoms just after birth, but is often infected in the ordinary manner some time after.

Diagnosis.—From what has been said it will be gathered that the diagnosis of scarlatina in a puerperal woman presents no greater difficulty than it does in ordinary cases. In ordinary cases there is not always freedom from uncertainty.

In the case of the lying-in woman it must be remarked that she is liable to attacks of evanescent rashes of various characters, and that a scarlatiniform rash is not extremely rare (see pp. 528, 530).

The points of importance in enabling us to form an opinion are : a history of exposure to scarlatinal infection ; the character and distribution of the rash, and its persistence ; the throat symptoms ; the amount of illness of the woman ; the amount and persistence of the fever if any exist ; and afterwards to help to settie the question—the desquamation.

In septic cases a rash appears sometimes ; but, as a rule, this is only where the affection is severe, and then it may be erythematous, papular, or petechial. The erythematous rashes are liable to be, and probably often are, mistaken for scarlatina.[1]

Prophylaxis and Treatment.—Since scarlatina is a disease which cannot, as septicæmia does, arise in the absence of infection from an already existing case, the methods of preventing the conveyance of it from one patient to another are fairly simple.

They consist in a complete change of the clothes, and a disinfection of the body, of the medical man or nurse who has been recently in contact with scarlatina. Disinfection is best carried out by means of a complete bath in a solution of carbolic acid, iodine, or corrosive sublimate, special attention being given to the hair and beard.

In the hurry of practice few men will have time or inclination to take these precautions after seeing scarlatinal cases. But it is desirable that at least the doctor should change the coat in which he has visited such cases, and that he should use all possible antiseptic measures in the conduct of his next labour, paying especial attention to the disinfection of his hands and nails.

The treatment of scarlatina in puerperal women differs in no way from that employed in ordinary cases ; namely, support of the patient's strength, and alleviation of any troublesome symptoms.

[1] Cayley, in discussion on Boxall's paper : *loc. cit.*

It is well, especially if the disease does not show itself until a few days after labour, to separate the child from the mother, and either provide a wet-nurse or feed it artificially.

Small-pox; Measles; Diphtheria; Enterica; Typhus.—Women recently delivered are naturally as open as others to infection by the above zymotic diseases. When this happens the danger to the woman is serious or not according to the severity of the disease and her power of resistance.

A 'diphtheritic' condition of wounds of the vagina, such as is found in some septic cases, has no connection with ordinary pharyngeal diphtheria, so that if such a source for any wound condition of this kind be sought, it will probably not be found. The treatment of these cases is the same as when the diseases arise in non-puerperal persons.

(For puerperal infection of the new-born child, see p. 584.)

CHAPTER LXXI

DISEASES OF SPECIAL SYSTEMS

Vascular System

Thrombosis

A. *Of Veins of the Pelvis and Limbs.*—Thrombosis of the torn uterine sinuses at the placental site, and to some extent of the veins lying in the uterine wall, is normal after labour. Thrombosis extending beyond the normal limits and giving rise to symptoms sometimes occurs. It is probably due to septic absorption in nearly all cases, and is liable to attack women who have lost a considerable amount of blood at labour. It is very often preceded by a period of fever, though in some cases the temperature may have become normal before any symptom of thrombosis arises.

In nearly all the cases of thrombosis in the limbs which have been under the author's care in the General Lying-in Hospital and in St. George's Hospital, fever of septic origin, or conditions likely to lead to sepsis or indicating it, have been present during the lying-in.

Septic infection, when present in a puerpera, is in a more favourable position to give rise to thrombosis than usual. The pelvic veins, and especially those immediately connected with the uterine and ovarian plexuses, have been much enlarged during pregnancy, and the current through them must, now there is less blood passing, be very slow. In the thrombi in and about the placental site septic organisms, if present, can develop freely. If the coagulation has extended further, namely into the veins of the broad ligaments, there is an enlarged and advanced basis for septic developments. We do not know to what extent thrombosis normally occurs in these situations—in the acute flexures of the venous plexuses, for instance. Varicose veins are not at all uncommon here, and these certainly favour

thrombosis. It may be remembered that the veins of the upper part of the broad ligaments are compressed and nearly empty during the first days of the puerperium (see p. 213), so that any clots of important size will be found in the veins around the cervix. The cervix is the place where absorption of septic matter through breaches of surface almost invariably occurs in parametritis, and in cases of parametritis there is always thrombosis in the affected tissues.

Thus of the two sets of vessels returning blood from the uterus—viz. the ovarian plexuses and the uterine veins—the uterine veins are the more likely to be involved, and from these veins the clotting and phlebitis may extend to the iliac vessels, and thence to the veins of the thigh and leg.

The path of this extension is frequently not to be made out, and the thrombosis may first show itself in the lower part of the internal saphenous, or in the posterior saphenous vein.

These vessels are not infrequently varicose at this time, and owing to this and to the complete rest of the limbs the current in some parts of them must be very slow, giving an opportunity to any organisms circulating with the blood to rest and develop in favourable positions. It is possible, too, that in cases where the thrombosis appears first low down in the leg, the iliac vein may be partially or wholly blocked by a clot projecting into its lumen, slowing further or completely arresting the current.

The hyperinotic condition usual to the blood of puerperal women (p. 56) is said to favour thrombosis.

As a rule, thrombosis is the most important part of the complaint. Phlebitis is recognised by the tenderness on pressure along the vessel.

Suppuration in the veins and surrounding tissues is a very rare ending.

Symptoms, Signs, and Progress.—The attack begins on the tenth day or about then, with pain, usually acute, in one of the legs, in the calf or inner side of the thigh. The pain is increased by movement. When the limb is examined, a tender, hard swelling, of the thickness of the vein distended, sometimes nodular owing to varicose dilatations, and varying in length according to the extent of the thrombus, may be felt if the woman is not too fat, and if the clot is not beneath muscular or deep fascial layers. It is often very difficult to make out any cord at all after the most careful examination, but a tract of tenderness corresponding to the venous trunk can always be recognised. There is rarely any redness along this tract.

Œdema of the limb is the rule, but is not constant, and its absence in any case is due to the existence of free collateral channels, and to the elevated position of the limb. It is usually most marked in the distal part of the limb.

The affected leg is drawn up, and the thigh rotated outwards in nearly all cases. Sometimes both legs are affected.

Fever is commonly present. This depends on the activity of the inflammation, either along the vein or in the pelvis. The temperature usually reaches 101° or 102°, going higher if suppuration is pending, its increase then being very likely to be accentuated by a rigor.

If resolution is going to take place, the cord (if felt) and the tenderness remain for some three weeks or so; the latter then gradually disappears, and the cord remains later, to undergo absorption by slower degrees. If

there has been no œdema while the patient was lying down, the leg swells when the woman gets up, and if œdema was present it is again increased for a time. The tendency to swelling after the leg has been stood upon only disappears in the course of many months, often taking a year or more to go; and no doubt this is due to obliteration of a large trunk, and the slow formation of a collateral circulation adequate to doing the work in the upright position.

The left leg is the one affected as a rule if thrombosis occur in one only, and is nearly always the first when both suffer. The reason for this is no doubt the greater frequency of tears of the left side of the cervix, but it has been supposed by some that it is because the left common iliac vein is pressed on by the right common iliac artery.

Complications.—The possibility of suppuration has been mentioned. The most dangerous event, however, is the detachment of a part of the clot, and its entrance into the blood-current and deposition in the pulmonary artery or one of its branches. The portion detached will probably be derived from the end of a thrombus projecting from an affected branch into the lumen of the main vessel.

The effects of the distribution of small fragments of a septic clot have been mentioned (p. 540). In the class of case under consideration the action of the clot is purely mechanical, and the results of its arrest in the pulmonary artery are acute, and, if the main trunk is occluded by it, very striking (see Embolism of the Pulmonary Artery).

Thrombosis rarely occurs in the vessels of the arm. Such a case was recently observed in the General Lying-in Hospital in conjunction with thrombus in the saphenous and upper part of the superficial femoral veins.

Treatment.—This is the same as for phlegmasia alba dolens (p. 553).

B. *Thrombosis of Heart and Pulmonary Artery or Arteries.*—As a rule this condition in puerperal women is secondary to embolism from a pelvic or a femoral vein. Thrombosis does occur in the auricles and other parts of the heart when the blood-current is not rapid in the case of debilitated persons, and no doubt it may do so in exhausted puerperæ.

The clotting may extend from the right side of the heart into the pulmonary artery, or a portion of the clot may become detached and impacted in that vessel or one of its branches.

The *symptoms* usually arise after the second week. In the cases where the clot is produced by extension from the auricle or ventricle, the symptoms may take some little time in developing. Where, however, the thrombosis is secondary to embolism either from a systemic vein or from the cavity of the heart the first signs are very urgent, and sudden death sometimes ensues (see Embolism). If the embolus is a small one, and secondary thrombosis develops around it, as is believed to be the usual course, the symptoms begin suddenly with the dyspnœa of embolism. This subsides to some extent if the patient is going to recover, and the woman's symptoms vary according to the amount of coagulation subsequently occurring. That is, the dyspnœa may again arise suddenly and increase steadily. Fresh symptoms of embolism also may arise during the course of the

thrombosis from detachment of a clot which has incompletely plugged a vessel, and its being driven into a branch which it completely fills.

Although the woman's state is a most serious one, she may finally recover.

The *physical signs* consist of a bruit heard over the pulmonary area, with some irregularity of the heart's rhythm, while at first, at all events, air enters the lungs freely. Portions of the lung-tissue may later become pneumonic by the process of infarction. If the woman recovers, all clears up.

The *Prophylaxis and Treatment* are dealt with under Embolism.

Embolism

The embolism may be one of two varieties, pulmonary or systemic.

Pulmonary Embolism

This is the kind which is characteristic of the puerperal period, and for its occurrence a previous thrombosis is necessary. As already mentioned, the usual place of origin for such a plug is in the pelvic veins, particularly the plexuses of the broad ligaments, and in the veins of the lower limb.

The embolus may be of sufficient size to be arrested in the heart, and may then cause sudden death ; or it may pass through it and reach the pulmonary artery, blocking up the first branch which is too small to allow it to pass. The embolus is, however, sometimes arrested at a fork, getting astride the angle between the two branches. In this last case the clot may later on break into smaller pieces, and each of these may go on until it is again arrested in a smaller branch.

Thrombosis frequently follows embolism—always if there is time—and the embolus may indeed collect more clot around it on its journey.

Embolism has been known to happen during labour. In case of such a rare event, the sudden onset and the severity of the symptoms might suggest rupture or inversion of the uterus, and lead to considerable mistake. Embolism at this period is due to detachment of clot from the placental site, and this probably happens during some sudden and violent contraction.

Symptoms and Signs.—Sudden death in the lying-in period is most commonly due to embolism of the heart or pulmonary artery. The woman may, if the blocking is only of arteries of tertiary size, recover after the shock of the sudden obstruction.

The time of onset is usually during the third week or so, though it may be in the first few days. It may have been preceded by some evidence of septic pelvic mischief or of femoral or other thrombosis, or there may have been an uninterrupted convalescence up to the moment at which the attack occurs.

The woman is seized with the most intense dyspnœa. She can breathe and fill her lungs, but the feeling of suffocation is not relieved. The heart is acting tumultuously, and the face is livid and horror-stricken. If death does not occur at once or in a few minutes she may gradually improve, and the blood may be sufficiently aërated to carry on life if absolute rest is

maintained. If, however, any movement is made, she may have a fresh attack, or she may have one without having moved, and this again may be fatal or not. If she recovers, areas of lung corresponding to the blocked branches will become solid, being high-pitched on percussion, with signs of deficient or of no entry of air and of localised pleurisy.

Prophylaxis.—This is carried out by keeping every lying-in woman who has shown any sign of pelvic mischief, or who has a thrombosed vein, or who has any disease of the heart or vessels likely to lead to thrombosis, absolutely in bed and at rest. In the last-named cases this must be done until she has completely recovered her strength, and in the others until there is no marked pelvic tenderness on examination, and no evidence of any existing clot that may be disturbed. Of course no part where there is a thrombosed vein must be rubbed with liniments, or manipulated more than is absolutely necessary for diagnosis.

Treatment.—The first thing to do is to prevent the woman from using more of the oxygen of her blood than is required, and to give the heart as little work as possible. Absolute immobility will do this. The collapse may be relieved by diffusible stimulants—ether and ammonia. The inhalation of oxygen, if this, as is the case usually in hospital practice, is available, should have a very marked effect, though the author at the moment of writing is acquainted with no record of its use in such a case. Opium is recommended after the acute attack is over, and no doubt it will help to keep the heart quiet and make the woman comfortable.

There may be occasion and opportunity for venesection if the patient becomes intensely cyanosed, for by the relief thus afforded to the right side of the heart, which is over-distended by the dammed-up blood, the pulmonary circulation is enabled to be to some extent improved.

The idea that ammonia given internally may dissolve the clot is purely hypothetical, and the drug is, as far as is known, useful only as a general stimulant.

Systemic Embolism.—This process may occur in cases where there are vegetations on the cardiac valves, and differs in no way in its pathology or clinical course from ordinary examples of the same kind. Emboli may plug the cerebral, femoral, or brachial, or in fact any systemic artery.

The emboli may be septic, and the possibility of ulcerative endocarditis, causing multiple embolism, with its peculiar train of septicæmic symptoms, must always be borne in mind when such symptoms arise in a puerperal patient with previously existing or newly developed endocarditis.

CHAPTER LXXII

DISEASES OF THE VASCULAR SYSTEM (*continued*)

PHLEGMASIA ALBA DOLENS

Definition.—This is a disease almost, but not quite, peculiar to lying-in women. When fully developed it has an unmistakable appearance and feel. It consists in a tense, white ('white-leg,' 'milk-leg') swelling affecting the whole thickness of the leg, or, in exceptional instances, the arm. There is in the fully developed stage of the disease no pitting on pressure as there is in the case of simple thrombosis.

By Continental authors no clear distinction is made between this affection and ordinary thrombosis, the latter of which has been just described (p. 548); but in British works such a distinction is made, and with reason, as will become evident. The disease is not at all common.

Pathology.—The pathology of phlegmasia dolens is not yet completely ascertained. We know that there is always or nearly always thrombosis of the femoral vein to be felt at one stage or another of the disease. We know also that the fluid in the swollen limb is not simple serum, such as is found in ordinary thrombotic cases, but coagulable lymph. This great peculiarity, added to the fact that in the fully developed condition there is no pitting on pressure, distinguishes it at once from the other kind of œdema. It is supposed that some obstruction of lymphatics exists. This of course can only be a temporary obstruction, lasting for two or three weeks in its most marked stage, and is difficult to account for. Elephantiasis Arabum is the disease which would be most akin to it on the lymphatic-obstruction theory, for this consists in a hard œdema of the skin and subcutaneous tissue; and many cases of this are due to obstruction of the lymphatics by filariæ in a certain stage. In elephantiasis dilated lymphatics are found in the affected parts, and in the event of ulceration lymph is often discharged. But in the case of this disease either the obstruction of lymphatic channels can be shown, or the condition can be assigned to repeated attacks of deep dermatitis or chronic dropsy. In phlegmasia, on the other hand, there is no constant evidence of lymphangitis, of enlarged inguinal or other glands, or of dilated lymphatics, and the swelling attacks a previously healthy limb.

It will probably turn out eventually to be a special form of cellulitis. This view is supported by the fact that the disease is 'metastatic,' and appears in the other leg very frequently when the one originally affected is recovering; and that it frequently arises, possibly always if the facts were known, in connection with septic processes of some kind. It may arise in cases of sloughing cancer of the cervix apart from pregnancy.

Thrombosis of the vein of the limb affected is not always to be felt, and obstruction of lymphatics is not easily demonstrated, so that the only absolutely constant fact is the hard œdema. There is always some fever; and occasionally rigors are observed.

Symptoms and Course.—The attack most often happens about the third week of lying-in. It may very rarely begin as early as the first.

The first symptom is an acute pain in the calf or inner side of the leg attacked. The temperature rises moderately (102°), and there are sometimes rigors. Very often some pelvic inflammation is found to exist already, and then the temperature is already raised to start with.

In a few hours a certain amount of swelling appears, affecting the whole length of the limb as a rule, but occasionally not extending below the knee. The swelling pits on pressure at this stage. It gradually increases, and the limb becomes more tense and white, until some five or six days after the appearance of the first symptoms the skin looks as if the leg were distended with lard. It is shiny, and there may be seen groups of superficial blood-vessels which are probably thrombosed.

In the case of the leg the femoral or saphenous vein may have been felt as a hard cord while the œdema was soft, but cannot be made out in its tense condition. There is great pain on moving the limb, and tenderness on touching it. The fever is of a septic type as a rule. After a week or a fortnight in this state the tension in the leg begins to relax ; and the pain and fever, if the case is uncomplicated, subside. The leg goes through the soft stage again, and the thrombosed vessels may again be felt.

As one leg gets well the other may begin and then go through the same process of swelling. This happens in a fairly large number of cases.

The left leg is the one most commonly attacked, and if both suffer it is the first to do so. This at once suggests some connection with septic inflammation in the pelvis, since it is on the left side that parametritis is by far the more common.

After the characteristic œdema has disappeared, the course of things is the same as in the case of ordinary thrombosis. Suppuration is a most rare event ; if it occurs it is most likely due to septic phlebitis.

Treatment.—This is similar in the case of the present disease and in thrombosis. If the woman has got up after her confinement she must return to bed at once on the appearance of acute pain in the leg. She must lie on her back with the limb raised on a pillow which supports its whole length, for any edge will exert special pressure on the part lying on it. A cradle should be adjusted to protect the limb from the pressure of the bed-clothes, and sand-bags may with advantage be laid alongside the leg.

If necessary morphia may be given hypodermically for the pain, and hot fomentations of belladonna or laudanum may be continuously applied. In making such applications the greatest gentleness should be used for fear of displacing the clot ; and in no case should more handling be employed than is absolutely necessary. The woman must be moved as little as possible, and very slowly, for the purpose of passing evacuations alone.

When the swelling goes down—usually in a month or six weeks—and the thrombus has shrunk to a firm cord, the leg should be lightly bandaged from the toes upward with a flannel roller, and the patient must not be allowed up until all pain and tenderness has gone. There will be a tendency for the leg to swell after it has been used to stand upon, which will remain for many months, as a rule for at least a year, just as in the case of ordinary thrombosis.

Air-Embolism

This rare accident consists in the admission of air into the veins in too great quantities to be dissolved, or to be sufficiently finely divided to pass through the pulmonary capillaries. The bubbles then act as emboli, completely obstructing the lumen of the smaller arteries and capillaries, and, if a sufficiently large amount finds its way into the vessels, filling the cavities of the right side of the heart with froth.

Morbid Anatomy and Mode of Origin.—The air seems, in most of the recorded cases, to have entered the veins during some intra-uterine operation, such as the administration of an intra-uterine douche, either before the placenta was detached or after. More commonly it has happened before complete detachment. The nozzle of the douche-tube has, in some of the cases, not been inserted even as far as the cervix, and the douche has been intended merely as a vaginal one. Air-embolism has happened in cases where it has been necessary to introduce the hand into the uterus.

In a few of the cases there was no artificial interference, and the air must have entered spontaneously ; in others gas was formed in the uterine cavity by decomposition of the fœtus.

Bubbles of air may be found in the vena cava and the pelvic veins ; and in the subperitoneal vessels of the uterus. The right heart may be distended with froth ; air has been seen in bubbles in the coronary vessels, showing through the visceral layer of the pericardium ; and in all cases froth is found in the pulmonary arteries.

The mechanism of the entry of air is as follows : The mouths of the recently opened sinuses at the placental site, if they are not closed by thrombosis, are unable to close themselves independently of uterine contraction. If the uterus is distended passively, or possibly if a contraction raises the intra-uterine pressure while the placental site remains in a relaxed condition, as is believed sometimes to happen (see Inversion of Uterus), any air or gas which lies in contact with the open mouths of the sinuses is liable to be forced into them. This is no doubt rendered much more certain if an inspiratory effort is made at the moment.

No doubt a comparatively large amount of air must enter to give rise to the severe symptoms characteristic of this accident ; and it is quite possible that small quantities do enter occasionally, but are dissolved at once, or are at all events not large enough to give rise to important obstruction of vessels while they are being dissolved ; or they may not find their way to the heart at all, but remain in the pelvic veins during solution.

When the blood has been mixed with the air in the right side of the heart, the froth forms a complete plug in the pulmonary artery beyond, since it is unable to flow through the smaller divisions of the artery. The cardiac valves have no chance of acting properly, for the froth cannot float them up and force them into the position of closure. Moreover, owing to the elasticity of the air, it will undergo diminution in volume readily on contraction of the heart, and onward movement will not be a necessary result of contraction.

Symptoms.—The effect on the patient is similar to that of embolism of

the pulmonary artery. There are spasmodic inspiratory efforts, convulsions, and sudden death. It is said that a churning sound has been heard over the heart in some of the cases

Naturally all recorded cases have been fatal ones, so it is quite impossible to say that some other instances where attacks of dyspnœa have occurred, but where the woman recovered, were not due to this accident.

Treatment is unfortunately of no avail, or at all events has not yet proved so, in cases of this kind. Venesection has been tried, having been indicated by the asphyxia ; but, as might be expected, has been useless.

To prevent the accident, every care should be taken to avoid introducing air during any vaginal, and, *a fortiori*, during any uterine, douching.

This is best prevented by using the constant current from a douche-tin, and not the intermittent one from a Higginson's syringe, and by taking care that the delivery-tube and the nozzle are emptied of air before the nozzle is introduced into the vagina. Since a majority of cases have occurred before complete separation of the placenta, and some where water was injected into the uterus to induce labour, especial attention should be paid to the above points during the first and second stages of labour. Labour must never be induced by intra-uterine injections of water or air (see p. 362).

CHAPTER LXXIII

DISORDERS OF THE NERVOUS SYSTEM

INSANITY

THE subject of insanity in all states of the child-bearing woman has to be considered here, and it may be divided into the insanity of pregnancy, of labour, of lying-in, and of lactation respectively.

Child-bearing is known to have a particularly marked influence in causing insanity in those women who have an hereditary taint of madness or of other marked neurosis ; and 14 or 15 per cent. of all female lunatics owe their first attack of this disorder to the supervention of pregnancy.

In about two-thirds of all puerperal cases of insanity there is a family history of nervous disease.

The disorder occurs in about the proportion of one in every 4,000 births. It is not especially frequent in primiparæ, as possibly it might have been expected to be, but according to Savage it is commoner—during pregnancy, at all events—in multiparæ. It is more common in elderly primiparæ than in young ones. The patient, in the great majority of cases—almost always, in fact—is one who is debilitated by malnutrition, or excessive hæmorrhage, or exhaustion during labour, or by some illness occurring immediately after labour. Pregnancies rapidly succeeding one another, especially when the child is suckled in each case, have a very marked effect in helping to produce insanity. Clouston finds that a large proportion of the insanity of lying-in occurs after illegitimate births.

So, given an hereditary tendency, and some cause producing exhaustion, or intense mental excitement in a child-bearing woman, there is a fair chance of her having insanity of one kind or another either before, during, or after, labour ; and the first time it happens in a patient's history is most commonly during the puerperium.

The kinds of insanity which may occur in connection with child-bearing have no very special peculiarities, and its character may be that of mania, melancholia, or dementia ; but it will be seen, as the several periods are dealt with, that the nearer to parturition, before or after, the woman is affected, so much more likely are the symptoms to be of a maniacal character ; and the more remote the attack from delivery, the more commonly does melancholia occur. Of all cases of insanity in connection with child-bearing the percentage in the different periods is about as follows :

Pregnancy	Parturition	Lying-in	Lactation
12 per cent.	under 1 per cent.	58-60 per cent.	30 per cent.
(Mostly melancholic)	(Maniacal)	(Mostly maniacal)	(Mostly melancholic)

Insanity of Pregnancy

This is nearly always of the melancholic type. It begins sometimes in the second or third month of pregnancy ; sometimes towards the end. It is usually associated with *anæmia*, which to a greater or less degree is developed in any pregnancy, but which in these cases is often due to the exhaustion of previous pregnancies. Savage says that the common mode of production is as follows :—'A woman of insane family becomes pregnant, and with the pregnancy has some marked nervous peculiarities, which pass off and are forgotten till after delivery, when they reappear ; or when sleeplessness, irritability, and change of character usher in an attack of ordinary puerperal insanity. A second and third pregnancy, occurring within short intervals, are each followed by attacks of insanity. But with the fourth and fifth pregnancy the eccentricity of pregnancy becomes undoubtedly an insanity, and the patient, during the earlier months of pregnancy, suffers either from maniacal or melancholic symptoms, which may pass off to reappear after pregnancy, or they may continue steadily through the pregnancy up to delivery, and beyond it ; the patient seeming to become more and more unstable in consequence of preceding attacks of insanity, till at last a very much less force is required to upset the balance.' [1]

It has been mentioned that the normal mental state of women often undergoes some change during pregnancy, and no sharp line can be drawn between this almost physiological change and the milder forms of insanity occurring during this period. Apprehension of the approaching trial, or vaguely of nothing particular, becomes sometimes, especially in women with hereditary tendencies, or who have been affected previously, a settled dread, and developes into melancholia. The patient interprets insanely the slight disorders of pregnancy, and may imagine that her vomiting is due to poison, and so refuses food. She is often apathetic, caring nothing for her usual interests, and despairing of everything. Other moral aberrations may be present,

[1] Savage, *Insanity and Allied Neuroses*.

such as kleptomania, but this is rare. The intellect is affected only in severe cases, so that delusions, such as that just described of poisoning, are not the commonest phenomena. A tendency to suicide may be present.

In cases coming on in the earlier months the probability is that the patient will get better before term is reached ; but she may become insane again after delivery, and will very likely, but not certainly, be attacked again in future pregnancies.

Insanity making its appearance in the later months of pregnancy is very much of the same character as that which appears early, and the cases often recover before labour, possibly to relapse after.

Savage has noticed several cases of *General Paralysis of the Insane* during pregnancy, which have begun about then, and have continued to develope afterwards.

Insanity of Labour

The parturient woman may have a momentary attack of frenzy during the passage of the fœtal head. Lesser degrees of this are not uncommon and are of course only to be observed where an anæsthetic is not used. Mania limited to this period of labour is probably rare, but an attack of puerperal mania may begin at this stage of affairs.

The onset of labour has sometimes a temporarily restorative effect on women who have been insane during pregnancy ; they may become sane while labour is in progress, and relapse after it is over.

It is an important point also that an insane woman may be delivered unconsciously, and that she may be found in bed with a child which has been smothered : in this case she will probably know nothing of the matter, and cannot be held responsible for the child's death.

Insanity of the Puerperium

During this period, and especially during the first fortnight, the most characteristic form of the insanity associated with child-bearing arises.

It is probable that at this time primiparæ suffer more frequently than multiparæ, taking all cases together ; and this is to some extent because illegitimate children are usually the result of a first and not a later pregnancy. A moral shock of some kind is a very frequent precipitating cause, but given an hereditary tendency physical causes are of great or even greater importance than psychical : as, for instance, anæmia from pregnancies frequently repeated in a short time, especially if they have been followed by over-lactation. Septic illness is not infrequently found to precede an outbreak, and in considering this it will be remembered that primiparæ, with their more numerous lacerations, are rather more likely to be affected than multiparæ.

It is very questionable whether the administration of chloroform during labour can be considered a cause or only as a coincidence in the development of insanity ; cases, however, are recorded where labours conducted under chloroform have been followed by insanity in women who have had children before and after without an anæsthetic and without insanity.

Combinations of these causes as a rule co-exist, but heredity must always be remembered as the most potent factor.

Before describing the usual kind of case, the transitory mania which sometimes comes on early in the puerperium must be mentioned. Attacks of this kind are of great importance, as in the hallucinations under which their victim suffers she may kill her child.

She has a rapid pulse and excited appearance, and is talkative and violent. This goes off in a day or two ; and she will then know nothing of what has happened in the meantime, and cannot be considered responsible for what she has done.

An ordinary case of puerperal mania has the following main features : The woman becomes gradually uneasy in her mind, and is very irritable and depressed for no reason that can be made out. She sleeps badly, and sleeplessness should always put the physician on his guard in a puerperal case, and should (in every recently delivered woman) be carefully inquired after. She takes a dislike to her child, and very often to her husband.

Her depression is succeeded soon by excitement, and she talks rapidly and maybe incoherently. She is often indecent and blasphemous, and she refuses her food in a large number of cases. Savage says that in puerperal insanity there are a few symptoms which may perhaps be considered to be more commonly present than in other cases of mania : namely, sleeplessness, anxiety, aversion to relatives, erotic tendencies, mistakes of identity, with hallucinations of smell and taste, and refusal of food. The dislike felt for her child and husband may culminate in attempts at murder, especially of the child. This may happen not only in cases where the child is illegitimate and embodies to the woman the disgrace of her position, but also in cases where there is every reason for welcoming an infant.

She may also have suicidal impulses.

When the acme of the disorder is reached—and this is very soon in puerperal cases—the excitement is very marked, and illusions of sight and hearing, or of the other senses ; delusions ; and hallucinations are common. The woman is often reckless of all decency ; and she talks and behaves disgustingly, probably more so than in other forms of mania. Insomnia is frequent, and this, combined with the continued excitement, rapidly wears the patient out.

The bowels are confined, and the digestive functions generally are inactive. The milk and the lochia are usually diminished, or may be suppressed ; but this is probably most often the result of the exhaustion or the septic absorption so often co-existing with, and perhaps, especially in the latter case, causing the insanity.

The melancholic type becomes commoner in cases beginning in the later days of the puerperium ; and after a fortnight or three weeks is rather the rule. It begins in much the same way as an attack of mania. The delusions are of a hypochondriacal kind, and suicidal and homicidal tendencies are common.

Insanity of Lactation

The disorder is at this time always associated with exhaustion and anæmia. Instances of it are therefore commoner among the poor and ill-fed, and occur usually after some months' suckling. The longer the time which

has elapsed since labour, when the attack begins, the more likely is the case to be entirely *Melancholic.*

The woman is pale, and has all the other symptoms of anæmia, breathlessness, œdema of legs, palpitation, and indigestion and constipation. Her mental condition is much the same as that of the woman who becomes mad during pregnancy ; but her intellectual faculties seem to be more commonly affected here, in addition to her moral ones. Delusions are far more frequent, and she may suspect her friends and others of plots against her, and of persecuting her. She also has hallucinations.

Dementia sometimes begins after delivery. The woman becomes apathetic, and indifferent to cleanliness and her personal condition generally. She may get better of this, or it may be the beginning of a progressive dementia.

A very large proportion of the cases of insanity after labour eventually recover. The outlook is best in the later, melancholic type of patient, who gets better in three to six months according to Savage's experience. The same author says that a fair proportion of the cases of acute mania die. In future pregnancies there is always a prospect of recurrence, either during the puerperium or during pregnancy ; this has been already mentioned. If, however, the woman never becomes pregnant again, it does not follow that insanity will be prevented.

Generally speaking, then, the immediate prognosis is rather good than otherwise, taking all cases together ; but a certain number are found to not recover their reason at all ; or to remain permanently weak-minded, even after a first attack. Savage believes that as long as the physical condition remains at a low ebb, in the case of insanity or weak-mindedness which has gone on for many months, there is hope of the patient's recovery of her reason ; but that if the physical health is re-established without mental gain the prognosis is bad.

Diagnosis.—Hysteria may in some phases resemble an attack of mania, and in a few it is very difficult, if not impossible, to distinguish at once. The main point is that the former is quite a temporary and short-lived aberration, and that the element of intense self-consciousness is always to be made out at some moment or another by anyone who has been accustomed to observe such cases.

Delirium of Fevers. Delirium Tremens.—These two conditions resemble for a short time—especially the latter in its hallucinations and the former in its incoherence—attacks of mania. They are both liable to occur in the recently delivered woman ; the former in septic cases, and the latter in alcoholic patients in whom the strain of delivery has caused an attack. There will be no difficulty in diagnosis if the possibility of their occurrence is remembered.

Insane women may become pregnant. The prognosis in such cases will be much graver than that in recently developed madness. Cases of lunacy cured by pregnancy have been cited, but are not sufficiently frequent to be taken as more than coincidences. As a rule the effect of pregnancy is not good, and the offspring is certainly most undesirable.

Treatment.—Simple treatment only is required in the great majority of instances. It becomes in a certain proportion a question whether the patient

should be sent to an asylum or not. If the necessary attendants can be afforded, and the patient isolated from her relatives, it is better to treat the case at home, for both the woman and her friends will feel that asylum treatment is something always to be ashamed of. When the above-named opportunities do not exist, and the patient needs constant watching to prevent her from damaging herself, or special feeding, removal to an asylum is really the only reasonable means to employ. There is no doubt that instances have occurred, and often occur, where insanity has become established, owing to injudicious treatment, which would in all probability have completely recovered under the influence of the isolation discipline, and skilled treatment of an asylum.

Seeing that the majority of puerperal lunatics suffer from anæmia or exhaustion, it is obvious that the feeding is most important. The patient should be made to take milk, eggs, and meat juices, either cooked or raw, at certain determined intervals, in addition to her ordinary meals, which should always be retained as a basis for the diet-sheet. In a certain proportion of cases forced feeding may be of benefit, and in some absolutely necessary.

Iron preparations will be most useful in anæmic cases, alone or with arsenic. Cod-liver oil, maltine, and other foods of this kind should be given when needed.

Sedatives and Stimulants.—Sedatives, certainly in maniacal cases, are only effectual during the actual time that the patient is held down by the drug, for she wakes up as bad as ever. Savage says they usually fail, and often do harm. In melancholia they are possibly of more avail, but they tend in all cases to further lower the patient, and the reverse of this is what is wanted.

Opium in the form of morphine is possibly useful in a few cases; and nyoscin in doses of $\frac{1}{120}$–$\frac{1}{80}$ grain has been used, and in some cases has answered well. Paraldehyde in ʒss–ij doses is said to have no unpleasant effects.

Alcohol, however, is free from objections of the above kind if given in suitable doses. It helps assimilation and thus nutrition, and often acts as a sedative. It should be given in small doses frequently, and the indications for its use are those relied on in other circumstances. A fairly large dose taken at bedtime is often the best narcotic.

The bowels should be carefully attended to in all cases. Any rise of temperature should have its cause at once investigated, and removed if possible. Septic cases are treated on ordinary principles.

The patient should be sent into the country or to the seaside as soon as it can be managed.

Induction of premature labour, which has been recommended in cases of insanity of pregnancy, should only be used when other conditions—such as intractable vomiting—require it; never for insanity alone.

During labour any great excitement, especially if due to the agony of the head-delivery stage, is an indication for chloroform and assistance.

In cases treated in asylums, which threaten to become chronic, it has been found useful in many instances if there is no distinct contra-indication, to send the woman home on probation for a short time. At this stage the familiar surroundings and duties of the house may work a cure.

Hysteria and Emotion

Not infrequently in women inclined to be hysterical at other times, hysterical manifestations occur during or after labour.

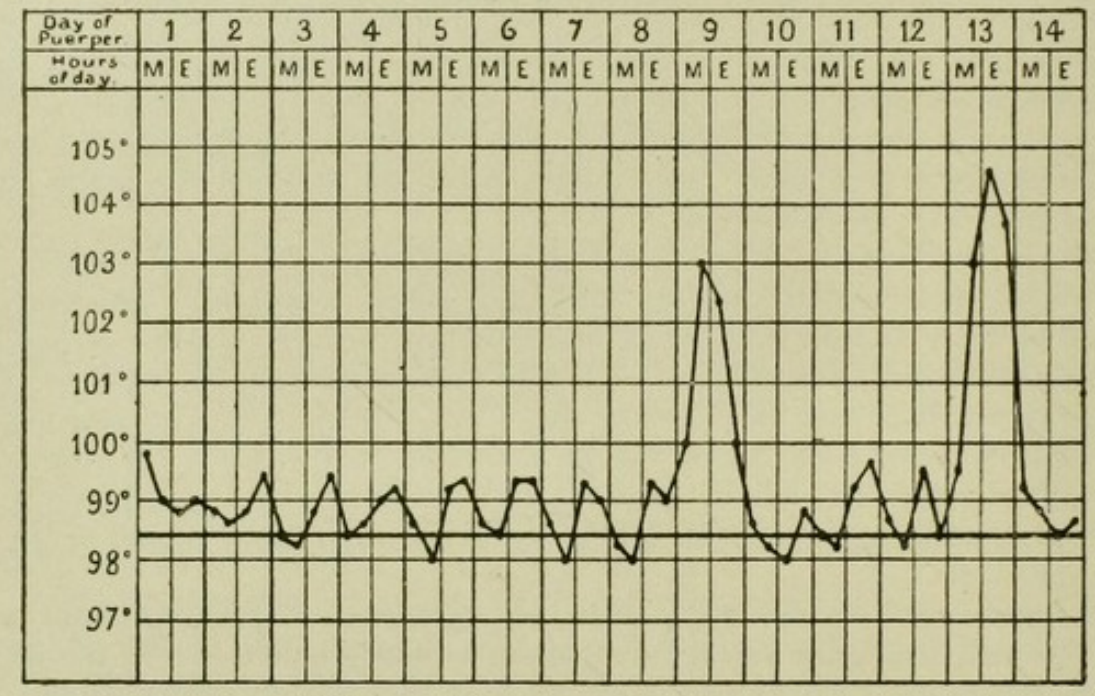

Fig. 388.—Mrs. F., æt 24. Primipara. Rise of temperature due to emotion. A visit from a lunatic husband occurred immediately before each rise. The patient was quite well throughout.

Those occurring when the patient is suffering pain, and is excited, and loses some of her self-control from that cause are unmistakable, and their intensity varies between the widest extremes.

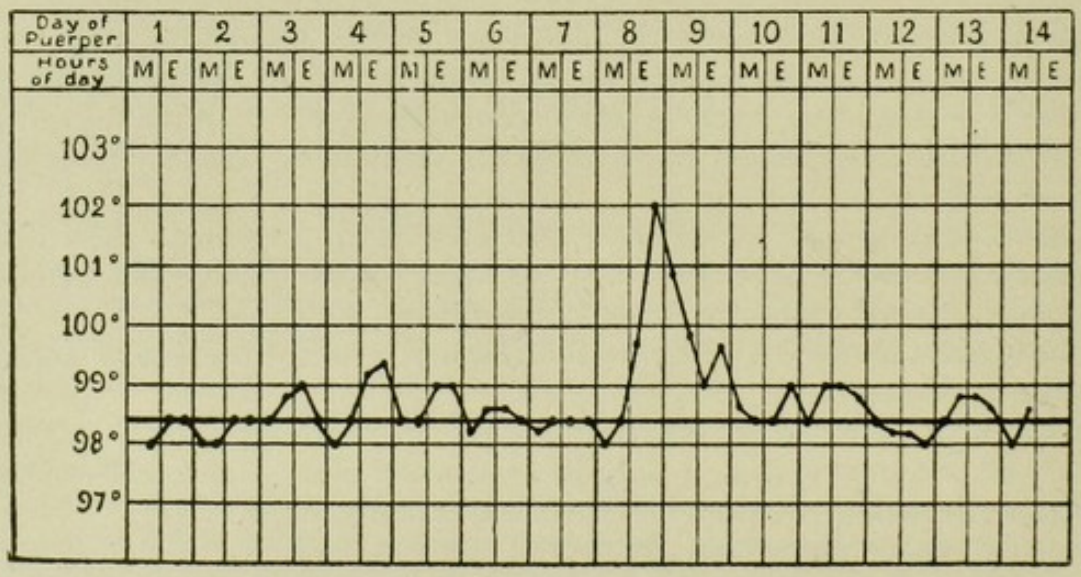

Fig. 389.—Mrs. H., æt. 26. 5-para. Rise of temperature accompanying a hysterical fit.

After labour, however, women sometimes suffer from symptoms of a hysterical nature which require care to distinguish them from more serious affections. Many cases have been recorded of high temperature, uninfluenced by medical treatment, and unassignable to any physical cause.

Though, no doubt, a proportion of them were really septic, or due to mammary tension or to constipation, instances are frequently met with where slighter moral disturbances, caused by some exciting news, a first visit from the husband after labour (fig. 388), or some event which has annoyed or alarmed the patient (fig. 389), are accompanied by a rise of temperature. Such examples of sudden pyrexia show a correspondingly rapid return to the normal, after a night's rest, or a small dose of some sedative.

Hysteria of a more pronounced type if accompanied or evidenced by fits must be distinguished from eclampsia. It is not at all difficult to do this, if ordinary care is taken to observe the character of the convulsions.

It is only necessary to mention that hysteria may simulate also tetany, mania, tetanus, more especially trismus, various paralyses; and collapse suggesting hæmorrhage, to put the medical man on his guard, and lead him to recall or ascertain his patient's previous history.

Paralyses and Pareses

It has been mentioned under Embolism (p. 552) that plugging of cerebral arteries may occur during lying-in. The symptoms here differ in no respect from softening in the non-puerperal woman, and will not be now enlarged upon. The effects of the plugging of other arteries than the cerebral are also unmodified by lying-in. Apoplexy has been mentioned in connection with Bright's disease in pregnancy.

The paralyses and pareses belonging essentially to labour, are those caused by the pressure of the head during birth on the structures in the pelvis; or more rarely, from spread to the nerves in the pelvis of inflammation of the neighbouring tissues, due to mechanical injury and septic absorption.

True paralyses of the bladder and urethra are extremely rare, and will be dealt with on p. 567.

Paraplegia and hemiplegia are caused either by pressure on parts of the sacral plexus, or by extension of inflammation to its nervous trunks.

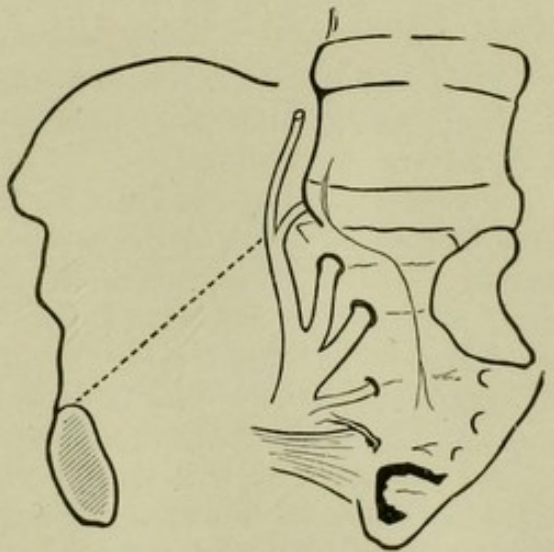

Fig. 390.--Lumbo-sacral cord crossing the brim.

As the lumbo-sacral cord (fig. 390) enters the pelvis from above to join the sacral plexus it crosses the brim over the ala of the sacrum. In a normal pelvis it is protected from pressure by the slight projection of the promontory, but in some cases of prolonged labour from malpresentation, or in some contracted pelves, it is exposed to injury from the tightly fitting head. This pressure affects one side only.

The usual course is that great pain is felt in one or both legs during labour; and this remains in a lessened degree afterwards; at the same time there is paralysis of the leg corresponding to the plexus pressed upon. The sensory fibres soon recover, but the motor affection remains. The muscles

most likely to be affected are those on the outer side of the thigh, and those of the calf and the peroneal region corresponding to the ultimate distribution of those fibres which run in the lumbo-sacral cord.

The patient is unable to move her leg normally, or perhaps at all; and when the time comes for her to get up, cannot walk on it. The symptoms in inflammatory cases are much milder. Recovery gradually ensues, and is almost universal. Sometimes, however, trophic changes in the muscles have occurred; and rarely the lumbo-sacral cord has been so damaged that permanent paralysis has resulted.[1]

The only way to prevent it is not to allow pressure to be exercised on the structures at the brim, but to help the head by some means (forceps, craniotomy) through it; or to rectify mal-positions.

The forceps, although often blamed for causing it, would really, if used in time, prevent it; and in cases where its use is supposed to have led to paralysis, the damage has probably been done before it was applied.

The ordinary treatment for muscles with lesions of their nerve-trunks will be necessary if any nutritive changes commence; and in slowly recovering cases, a careful watch should be kept on them, their electrical reactions being tested occasionally, so that no time may be lost in beginning the necessary treatment.

Cases of paralysis should not be confused with those of *relaxation or rupture of the pelvic articulations* (p. 501), which cause in severe instances great lameness; nor should *femoral thrombosis* be missed in examining a case with symptoms resembling paraplegia.

Tetanus

This very grave disease is fortunately rare after delivery in this country. In India and in other hot climates it is commoner, just as tetanus is under all traumatic conditions.

There is nothing special in its features when it attacks a lying-in woman, except that the wound or wounds at which the tetanus-organism finds entrance will be somewhere in the genital tract. It occurs about as frequently after abortion as after labour at term. In cases where a post-mortem examination has been made, a fair proportion have proved to be septic, though of course it will be understood that this fact has nothing to do with the tetanus, beyond showing that septic organisms have been able to obtain access to the internal tissues, and explaining how those of tetanus have been able to do so too. It is probable that this is the route of infection in all puerperal cases of tetanus, and that it is so is pretty well proved by the fact that most cases arise after manual interference in labour or abortion.

'Idiopathic Tetanus' is not now admitted to exist.

The interesting experiments of Nicolaier, who produced tetanus by introducing common garden soil into wounds, and similar ones by Carlo and Rattone who used the dust from some old buildings during the demolition of which numerous cases had occurred among the workmen, show that tetanus poison or its specific organism is to be found in unexpected

[1] *Int. Jour. Med. Sci.* 1893, ii. p. 116: Lamy, 'Peripheral Neuritis.'

places ; and other observations have been made connecting instances of this affection with recent exposures of soil.

The clinical symptoms do not differ in puerperal cases from those in general surgical practice. Symptoms seem to arise within the first week, with trismus and other nervous affections usual in this disorder.

Recovery follows in a small number ; the mortality in a series of cases collected by Gautier being 86 per cent.[1]

Prophylaxis is naturally of vital importance, and may be completely obtained by the strict use of antiseptics.

Treatment.—Sedatives, opium and chloroform, are the most useful, especially the latter. The nutrition of the patient must be carefully attended to.

The treatment by antitoxic serum, according to the researches of Roux and Vaillard and Kitasato, seems to be established on a firm basis, and will in time, no doubt, give brilliant results. The reader is referred to surgical works for details on this subject.

Tetany. Tetanilla

This disease must not be confused with tetanus ; especially in the puerperium. It was among nursing women that Trousseau observed nearly all his cases. He was the first to describe this disorder, giving it the name of 'Contracture des Nourrices,' as well as that of 'Tetanie.' It occurs in children not infrequently. In pregnancy and under other circumstances it is much more rare.

It consists in a tonic spasm, as a rule painful, which always begins in, and is often limited to, the muscles of the extremities, especially those of the hands. It may advance from these starting points and become almost universal. It is always symmetrical (when not artificially induced), and it never causes loss of consciousness. Its attacks are intermittent and of short duration (five to fifteen minutes), and though they may occur daily or oftener over a long period, occasionally months, recovery is the rule.

The spasms are preceded by tingling or numbness, or both, in the extremities to be affected, and the same sensation follows relaxation. They have the peculiarity that during their intermissions they can be re-induced in a limb by compression of its main artery or nerve, being preceded by the sensory disturbances mentioned. The application of cold has the same effect. The electric reaction of the involved muscles is qualitatively as well as quantitatively altered.

The attitude assumed by the hands during the spasm is due to the action of the interossei muscles. The thumbs are thus fully adducted, the metacarpo-phalangeal joints of the fingers are flexed, and the phalangeal extended. The wrists are flexed. In the feet the corresponding muscles are affected.

The predisposing causes include any exhausting condition, such as prolonged nursing, diarrhœa, and (in two recorded cases) vomiting.

Diagnosis.—It is to be distinguished from tetanus by its mode of starting ; by the intermittency of the spasms ; by its occurring in weakly

[1] *Rev. Méd. de la Suisse Romande*, No. 12, 1889.

women and children ; by there being no elevation of temperature ; and by its being, as a rule, a trifling disorder. From hysteria it is diagnosed by the absence of cerebral disturbance ; and by the fact that the spasm is always symmetrical. The distinction from spinal meningitis, epilepsy, and certain cases of uræmia—diseases which resemble tetany in being attended with spasms—is not difficult.

Treatment.—Special measures are hardly ever necessary. Any exhausting condition should be treated ; and if the spasms are very severe and especially if they spread near the more important parts, inhalation of chloroform should be used in appropriate degrees.

Induction of labour when tetany occurs in pregnancy may have to be considered in some severe cases. If it is done, it will be for the condition which underlies the tetany, as, for instance, pernicious vomiting.

Blindness from Lactation.—Three cases of blindness have been recorded by Nettleship [1] which have occurred in the course of a lactation ; and where albuminuria, acute anæmia, &c. were not present. In two of the three there were the remains of optic neuritis. They were all probably due to exhaustion, and should be classed with those cases which occur in connection with chronic anæmia.

CHAPTER LXXIV

DISEASES OF SPECIAL SYSTEMS (*continued*)

Urinary System

Cystitis.—This complaint may be part of puerperal septic infection occurring in the peri- or parametrium ; or it may be a catarrh of the mucous membrane spreading from the urethra, which has been lacerated or bruised during labour ; or due to the use of a dirty catheter, or the omission of antiseptic precautions in passing it (see p. 184).

In the former case the disease and treatment merge into that of the graver trouble. In the latter, if the cystitis is due to bruising or laceration of the urethra, or possibly of the bladder itself, though this is improbable, owing to the germ-free state of the interior of that organ, recovery occurs as a rule without treatment. If, however, septic matter has been conveyed into the bladder by a catheter originally dirty, or by the introduction of lochial secretion owing to carelessness in washing the vulva before catheterisation, the inflammation may be more severe, and may become chronic, or may spread to the pelvis of the kidney if left untreated.

The symptoms are pain and frequency of micturition, the pain sometimes lasting for several minutes after the passing of urine, or even being constant. There is tenderness on pressure over the pubes. The urine contains much mucus, pus, and, if the attack is severe, blood.

[1] *Roy. Lond. Ophthal. Hosp. Rep.* vol. xiii. pt. 3.

The prophylaxis consists in the observation of the precautions mentioned on p. 184.

Treatment.—During the recent stage, hot fomentations over the hypogastrium, warm hip-baths, and alkalies are the best remedies, the diet consisting of milk and large quantities of water or soda-water.

Later, when the acute symptoms have subsided, the bladder may be washed out with a funnel and tube attached to a catheter, for which purpose a solution of boro-glyceride (boracic acid ʒiij ; glycerine ʒi, dissolved by gentle heat) in an equal quantity of water, or boracic acid (gr. ij–ʒi) are the best. About two or three ounces should be allowed to flow in, and then to run out again, the funnel being lowered for this purpose. Another ounce should then be injected and left in. Care is taken that no air enters the bladder.

Betol (β naphthol) in 5-grain doses has been used internally, and as a local application with success.

Urethritis, if not gonorrhœal, will subside spontaneously. If it be due to gonorrhœa, treatment should be commenced at once, so as to prevent cystitis occurring. This would consist in the administration of alkalies and sandal-wood oil or copaiva, the use of the catheter being avoided.

Retention of Urine.—Milder degrees of this condition are common in the recently delivered woman, and have been already dealt with. They disappear after the first day or two.

Severer cases are due to spasm from urethral tenderness, or to the dread of the pain that micturition causes. The urethra may be swollen too, and the œdema will mechanically obstruct the flow.

Retention due to retroversion of the heavy and large uterus existing at this time has been found, and in the absence of other causes this one should be investigated.

Retention may occur as an event in septic fever when the patient is near death, or in paraplegic cases.

The main symptom is *incontinence*, or dribbling of urine, in cases where attention has not been paid to the regularity of action of the bladder ; there will be in this case a tumour reaching to any height in the abdomen up to the umbilicus, or even an inch or two above it. The over-distended bladder forces the sphincter arrangement, and urine dribbles away.

Regular catheterisation, as often as is necessary, and the treatment of any amenable cause are to be employed in such cases.

The opposite condition to Retention—that of **True Incontinence**—occurs most markedly in cases of vesico-vaginal fistulæ. It is found rarely when the orifice of the bladder and urethra have been much damaged by parturition, and the discharge of urine occurs when the woman coughs or laughs or bears down. Care must be taken not to mistake a case of retention with dribbling for true incontinence.

Rashes

The puerperal woman is occasionally subject to fleeting rashes, and these may resemble so closely the rashes of scarlatina, measles, and other exanthems, that the recognition of them as non-infective, ephemeral occurrences is of great importance.

These rashes occur without marked rise of temperature or throat symptoms.

In 180 consecutive cases observed by the author in the General Lying-in Hospital, twelve had rashes, uncomplicated with other symptoms, except in one case of tonsillitis; of these, eight were simple erythema, in some instances resembling the scarlatinal rash very closely, two were urticarious, and two were papular, resembling measles to some extent. The chest, thighs, and abdomen were the most commonly affected, no doubt on account of their being the surfaces of which the temperature was kept most constantly warm. The face was affected in one case only.

In no instance was any digestive disturbance traceable as the cause, and no treatment was adopted.

Pemphigus has been described as occurring, and miliaria sometimes appear.

Other rashes may accidentally occur during lying-in, such as lupus, chronic eczema, &c., and the rashes of scarlatina and other exanthems, and those appearing in connection with septicæmia.

Osseous and Ligamentous System

Relaxation of the Pelvic Articulations

The sacro-iliac and pubic joints become relaxed in normal pregnancy, and allow a moderate amount of movement of the bones on one another.

Sometimes in rare cases this becomes so marked as to interfere seriously with walking or even standing, but a lesser degree is not so very uncommon. Patients of robust physique are not so liable to suffer as more weakly ones, and it may occur at any age, and not necessarily at the first pregnancy.

The symptoms are first noticed when the patient gets up after her confinement and tries to walk. She then finds that she has pain in a greater or less degree at the symphysis, and in one or both sacro-iliac joints. Matthews Duncan says that pain in the pubic and one of the sacro-iliac joints are almost invariably found together, but both sacro-iliac joints are not invariably affected.

Considerable movement may exist without much impairment of walking power, or there may be a good deal of pain and lameness with very little movement.

With symptoms of pain and lameness dating from a confinement this condition should be suspected, and the pelvic joints examined and their mobility tested. In the case of the symphysis pubis, a hand may grasp the bone on each side by passing the thumbs into the vagina, opposing them by the forefingers outside, or the forefingers may be passed inside. A vertical

and a horizontal sliding movement may then be made out. Duncan says that the diagnosis in the case of this joint is very unsatisfactory.

The condition of the sacro-iliac articulations can be more easily estimated. The crest of the ilium is grasped, and the patient's spine being fixed by her standing, or assuming the knee-elbow position, attempts are made to move the hip-bone. If there is any mobility clearly made out, it is probably enough to account for the symptoms, as in the normal pelvis the bones are immovably united.

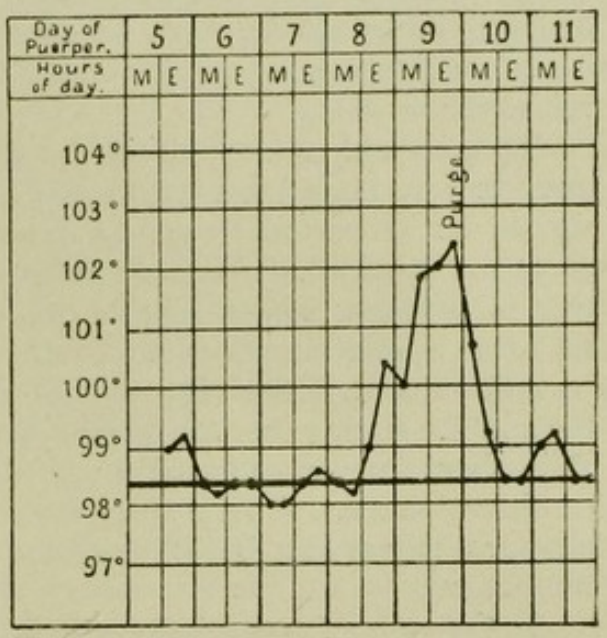

Fig. 391.—Rise of temperature accompanying constipation.

The treatment is to adjust a firm bandage round the pelvis. This must be made of some unstretchable material, such as horse-girthing, and its upper border should be level with the crests of the ilia, the lower reaching just below the trochanters. The patient should then walk about as usual, and bear the pain if any still exist.

The bones usually become fixed again after some months, but in a small minority treatment is unavailing, and the bandage has to be worn constantly.

Alimentary System

Constipation

This condition, common among lying-in women, is sometimes made especially conspicuous by a rise of temperature, as has been mentioned already. The accompanying chart (fig. 391) is an example of a very common occurrence.

CHAPTER LXXV

Affections of Breasts and Nipples

Retracted Nipples

This is usually a congenital defect, though it is said that the constant pressure of ill-made stays, especially during puberty, may bring it about.

In marked cases the position of the nipple is merely indicated by a depression, and the surface on which the ducts open is buried in the middle of the areola. No attempts at pressing the surrounding tissue down will cause the nipple to emerge. Between this condition and a normally-shaped nipple there are all gradations. In slight cases, although the nipple is quite

depressed, it can be induced to emerge—during manipulation it undergoes erection—and to project sufficiently beyond the areola to be able to be seized by the child.

The depression leads to excoriations and fissures, for the nipple is difficult for the child to retain in its mouth, and the epithelium gets damaged owing to its being frequently seized and frequently escaping.

In marked cases the child cannot get hold of the nipple at all, and will refuse the breast.

This condition may, in nearly all cases, be remedied before labour by attending to the breasts in the way already described (p. 77). The patient should be instructed to gently draw out the nipple with the forefinger and thumb daily during the later months of pregnancy. There is little or no fear of inducing labour by this proceeding, but the remote possibility may be borne in mind in patients who are disposed to abort.

After labour, if the nipples are still insufficiently developed to allow of the child's seizing them, a breast-glass should be used to draw them out This should never cause pain ; if it does, further attempts must be very cautiously made. A very good remedy is to apply a strong baby occasionally for a day or two, but this method is not always possible, nor pleasant to the patient.

If the woman's own baby will suck through a nipple-shield there is no great difficulty. It usually will do so, and the nipple then is gradually drawn out, so as eventually to be large and free enough to be used naturally. If the nipples become sore the child may have to be weaned. An attempt should be made to give enough rest to the nipple to heal the sore, while preventing the breast from becoming inactive, by using a breast-glass, or by the nurse gently milking the breast once or twice a day with the finger and thumb (see next page).

If after all efforts there is not enough nipple on either breast, and the shield is of no use, the child must not be nursed by its mother.

Sore Nipples

The sore may be an abrasion on the surface of the summit, or a crack at its base. Sores are caused by depression of the nipples, as above described ; by want of cleanliness during pregnancy, the crust which forms owing to the oozing secretion being a cultivation-medium for organisms ; by want of care in drying and wiping the nipples after each application of the child ; by sores (aphthous) in the child's mouth ; possibly by syphilis.

On inspection there may not be much to be seen in cases where the summit is affected, but sometimes a reddish or greyish surface may be noticed, especially if ulceration is going on. To see the cracks at the base, the nipple must be drawn over to the opposite side to the crack, and its extent can then be made out. Sometimes the ulceration turns out to be very deep, and has been known to extend almost through the base of the nipple.

Sore nipples, even of a slight degree, cause great pain to the mother when the child sucks, and this may be so severe as to produce marked nervous symptoms and rises of temperature.

They are very important on account of being the channel through which septic organisms find their way into the tissues of the breast. As they often bleed when the child sucks, and it swallows the blood, the child may appear to be suffering from hæmatemesis. In all cases of vomiting of blood in the infant, the mother's nipples should be carefully examined. If the sores have anything suggestive of syphilis about them, such as rapid ulceration with clean-cut edges and a sloughy surface, diligent investigation must be made, and proper measures taken if there should be any confirmation of the suspicion.

The prophylaxis in these cases is most important. It has been already dealt with (see Chapter IX., Hygiene of Pregnancy; and p. 231 in the Management of the Puerperium).

Treatment.—If only one breast is affected, it should be allowed to rest for a day or two, and the other one alone should be used. If both nipples are sore, an attempt must be made to cure them while suckling is still going on. The best plan is to bathe the one or both well with a 1-1000 solution of sublimate, leaving a little gauze soaked in the lotion on the nipple for a few hours. Then wash carefully with plain warm water. If only one is slightly affected this will heal in twenty-four hours.

If both are only slightly sore, a nipple-lotion may be used after each nursing. The one found most serviceable at the General Lying-in Hospital is made of equal parts of glycerine of tannin, and a 1 in 20 solution of carbolic acid; glycerine of borax is also useful. The nipple is carefully wiped, and the lotion applied with a brush. The nipple is washed just before the next nursing. A shield should be used in nursing to prevent friction.

If both nipples are much affected suckling must be stopped for a few days. The breasts can be relieved of the excess of milk by the nurse pressing it out of the ducts with her fingers, a method easily acquired. She can avoid touching the sores without difficulty, and this method is on that account much superior to the use of breast-pumps, since the traction of these interferes with healing, and may cause bleeding. This mode of treatment can be persevered with, in the case of a woman with active breasts, for three or four days without danger of the secretion ceasing. It may be necessary in some cases to touch indolent sores with solid nitrate of silver.

Mastitis and Mammary Abscess

Inflammation of the breast may begin in the gland itself, or in the connective tissue on its deep or superficial aspect.

In the case of the connective tissue, over or beneath the breast, infection in all probability always occurs by way of sore nipples.

In the case of the inflammation of the breast tissue proper, glandular or connective, the path of entry of organisms is usually the same; but in some cases, no doubt, where on the third or fourth day of lying-in, the acini become tense with the rapidly secreted milk, owing to the ducts not being readily pervious, the tension damages the epithelium of the ducts, and enables organisms entering along the ducts to make good a footing, and cause inflammation,

It will be convenient to divide inflammation of the breast into two classes on this basis.

Early cases, mostly caused by Infection along the Ducts.—These will occur during the first week, usually beginning about the fourth day, when the tension is greatest. The breast is swollen and tense, and the distended lobules can be felt as hard, tender masses of one or two inches in surface-measurement, and appearing to be an inch or more thick, which are distributed to a greater or less extent over both glands. If the milk now finds an outlet and the tension is relieved, the tenderness and swelling subside, and the breast assumes its functions normally. But if the tension is kept up in all or any of the lobules the symptoms increase, the temperature, which in the early stage just described is often raised somewhat, runs up to 102° or 103°, and the patient has general signs of fever. The axillary glands are sometimes swollen and tender. Even now suppuration hardly ever occurs, and the engorgement is relieved spontaneously. Pus may form, however, in weakly women, but in this case it is exceptional for more than one lobule to be affected ; and a small abscess, holding about a drachm of pus, is the result.

Later cases, where Infection takes place through Sore Nipples.—The other class where septic organisms have been able to make their way in through fissures and excoriations do not occur until later, as a rule after the first fortnight. Such cases are much commoner in under-fed ill-nourished women, or those of a tubercular tendency, than in robust ones, and often occur in women who have suckled too long. Strong health, however, does not exclude the possibility of inflammation. The inflammation and the abscess which follows may occur a week or more after the sore or fissure has healed.

All sorts of pus-producing cocci have been found in breast abscesses ; of course they exist in all, sometimes in pure cultivations, sometimes in mixed. The inflamed mass of tissue consists of one or several foci in one or more lobules, and the surrounding and intervening connective tissue. It generally lies in the lower half of the gland, owing to the more dependent position of this part.

The abscess behaves in the ordinary way, and has the ordinary characters on examination. It points as a rule at its most dependent part. If allowed to burst spontaneously, it tends to do this by a small opening, or by several small openings, which are often insufficient to completely drain it, and one or several sinuses often remain for an indefinite time.

Sometimes a duct communicates with the abscess cavity, and a milk fistula is formed. The abscess occasionally bursts into a fair-sized duct, and discharges pus through the nipple with the milk.

There may be numerous foci of suppuration which have not, as they usually do, coalesced to form one abscess, and they may each have a vent of their own. If left untreated, the breast is continually healing in one part and breaking down in another, and much of the breast tissue is eventually destroyed.

Rarely an abscess becomes chronic. When it does, it may have many of the characters of malignant disease, and a certain number of such cases have been operated on under the impression that a cancer was present.

The symptoms in acute cases are those of high fever (103°–107°) with rigors and other conditions associated with suppuration ; the axillary glands

are enlarged and tender. The acuter of these phenomena disappear on evacuation of the abscess.

Treatment.—The prophylaxis has been already sufficiently indicated. It is simple. Prevent the patient having cracked nipples, and feed her up well if she is below par.

In the first described group of cases where tension is the predisposing cause, free purgation is important to start with; and saline purges, especially magnesium sulphate, are the best. Hot fomentations, of which hot oil keeps its heat best, and firm pressure, or firm pressure alone if there is not much pain, are to be employed. A roller-bandage applied with knowledge over a layer of cotton-wool in a figure of 8 and stitched, is most effective; or a wide muslin bandage; or a waistcoat-shaped support cut to fit the patient, with holes for the nipples, may be used instead of the roller. Gently rubbing, or rather stroking, the breast from the edge to the centre is useful, but may be harmful if roughly or too frequently applied. The child should be put to the breast regularly three times in the twenty-four hours, or if it is not strong enough to suck freely, a breast-pump may be gently used. If the child is dead, the same pressure should be employed, but the whole surface of the breast, leaving out the nipples, should be covered with lint smeared with equal parts of extract of belladonna and glycerine. The pressure is the more important factor.

In the other class of case, the treatment should be much the same at first. Hot fomentations and pressure are again the best agents. Here no stroking or rubbing is admissible.

The bowels should be kept freely open, and the patient's strength well supported by a generous diet, cod liver oil and port wine.

The child should not be suckled for the first day or two of the appearance of signs of inflammation (by the end of this time the question of suppuration or not will have been decided), and the same method pursued as advised in the case of cracked nipples (p. 571).

The patient must lie down in bed.

If an abscess is unmistakably forming, the same treatment, except that suckling must be entirely abandoned, should be pursued until an incision can be made to the most advantage. This is done directly there is some indication of the position of the pus. The incision is made so as to radiate from the nipple, thus avoiding as far as possible the division of ducts. Strict antiseptic precautions will of course be observed, and it is well to take some time in carefully squeezing out all pus, *débris*, and the pulpy granulation tissue found in all abscesses, as this procedure certainly promotes rapid healing. Drainage must be provided for in the usual way.

Superficial abscesses usually form and point earlier than those affecting the gland tissue.

Sub-mammary abscesses are often not easily recognised, and take some time to come to the surface. They nearly always point at the lower edge of the breast, and should always be opened there if possible.

In chronic cases, where there are sinuses, they should be freely laid open, scraped if necessary, and drained. Moderate pressure is often very useful in hastening the closure of such abscesses' cavities.

In abscesses which occur during general septic infection (pyæmia) the same treatment, modified according to circumstances, is to be adopted.

The breasts are liable to be affected with *eczema*, and with *erysipelas*. The former of these is rather of great inconvenience, than of any danger; but the latter may prove dangerous, owing to the possibility, if the mammary erysipelas occurs early in the lying-in, of the genital passages becoming affected and of septicæmia resulting (see p. 542).

They are both treated on ordinary principles.

Galactocele.—If a duct is completely stopped, and no organisms obtain admission, a collection of milk in a greater or less quantity may occur in the corresponding lobule. After a time the fluid part becomes absorbed, and the casein and fat remain. Or a cyst containing the watery part of the milk separated from the solids may be formed. This is a chronic affection, and is interesting as possibly leading to confusion in diagnosis. The swelling should be opened, and its contents cleared out.

Disorders of Lactation

Galactorrhœa

Nursing women occasionally suffer from the discharge of an excessive quantity of milk. In some cases the milk secreted is normal in quality, and is merely the result of an exuberant activity of the breasts. To this condition the term **polygalactia** is more properly applied. In such a condition, when the child is placed to the breast, milk is discharged in quantity almost enough to choke it, and often the other breast is stimulated and discharges freely. This is most apt to occur during the first week or so, and needs no treatment, as it naturally subsides in a short time. The cases which persist—the true cases of **galactorrhœa**—are those where a thin, watery secretion runs away, almost continuously, weakening already the atonic woman still further. In these cases the excess flow occurs in the absence of external stimulation. Such a condition reminds us of the secretion obtained from the sub-maxillary and sub-lingual glands when the chorda tympani is stimulated, and rather suggests vaso-motor paralysis.

The quantity lost varies in different cases, and is often not more than that secreted by a nursing woman in the ordinary way. It may be, however, in excess of this quantity.[1]

Its quality has been already mentioned. In one or two cases, however, the milk has been of quite the normal standard. Other cases are recorded where women have gone on secreting milk for five or more years, and one woman in America is said to have persisted in this function for thirty years, being enabled to suckle two of her grandchildren during the temporary inability of their mother.

As a rule, however, the woman's strength gives way. She has nursed a child possibly for the usual time, and is not fit to do so any longer, so that the persistent drain soon begins to tell. The disorder may, however, begin after an abortion, or the birth of a dead child. Phthisis has not improbably some influence in producing galactorrhœa.

[1] Seven litres in twenty-four hours. Winckel, *Path. u. Ther. d. Wochenbetts*, p. 440.

Sometimes there is to be found a cause in some abnormality of the uterus or ovary, such as a new-growth or inflammation, which may be supposed to irritate the breasts. The excessive flow may disappear with the advent of menstruation (or very rarely this may make it worse). It is sometimes concurrent with uterine hæmorrhage during lactation. It may occasionally be unilateral. Eczema of the breast and surrounding parts may occur from the constant flow of milk over the surface.

Treatment.—If the child is still being suckled, it should be weaned. The woman's strength should then be improved, and a change to a bracing sea-side place advised. The bowels are especially to be kept freely open.

An examination of the pelvic organs must be made, and any sufficient abnormality treated.

For local measures the best is firm elastic pressure, applied most efficaciously by strapping skilfully, adjusted over a layer of cotton-wool, care being taken to leave the nipple free. Equal parts of glycerine and extract of belladonna may be applied as already described.

Other measures are the administration of ergot (but given in small doses frequently), partly as a general vaso-motor constrictor, and partly from its special action on the uterus in cases where that organ is imperfectly reduced in size ; electricity, which is, however, probably useless ; and opium and chloral in moderate doses.

Deficiency of Milk

This is always due to some constitutional cause. It hardly ever occurs from smallness of the gland,[1] although instances have been known where the glands were absent ; and if women with this deficiency became mothers, of course they would have no breast-secretion. This is the only condition under which agalactia occurs. Very young mothers may have too little, as may elderly ones. Stout women with very large breasts are often not good nurses, for the mass of the breast is really made up of connective tissue and fat. Previous abscesses may have destroyed much of the gland tissue.

Imperfect nutrition, wasting diseases, profuse diarrhœa, emotion, and acute febrile conditions [2] may each cause failure to secrete the full quantity. There may, however, be no discoverable reason.

Treatment.—It may be said at once that local treatment is of no avail. Measures which are directed to strengthening the patient by tonics and good feeding, and a tranquil mind, are the only ones of any use.

[1] Altmann : *Ueber d. Inactivitätsatrophie der weibl. Brustdrusen, Virchow's Archiv, Bd.* cxi. p. 318.

[2] Becquerel and Vernois found casein, fat, and salts increased, and sugar diminished in febrile states.

CHAPTER LXXVI

ABNORMALITIES OF THE LOCHIA—DECIDUOMA MALIGNUM

THE normal lochial discharge gradually contains less and less blood, and steadily diminishes in quantity. In certain cases this course is disturbed by the appearance of a fresh accession of blood to the discharge, or even by one attack or more of hæmorrhage, sometimes amounting to flooding. A moderate increase in quantity is not uncommon in cases where clots have been retained, or have formed in utero, and occurs before, and at the time when the clot is expelled. Bleeding happens occasionally also when the patient gets up for the first time after her confinement, owing no doubt to an alteration in the blood-pressure in the pelvic veins on the assumption of an upright or sitting position, caused by the pelvis becoming the lowest part of the trunk. Small hæmorrhages are liable to occur on coitus when indulged in too early after delivery. In these cases they may appear after the lochia have recently ceased. The remedy in the two latter cases is a return to bed, and abstention from intercourse respectively ; in the former case expulsion of the clots is the natural cure.

Increase of blood in the lochia is sometimes due to excitement, to purging, to constipation, and perhaps to heart or liver disease, and when one of these causes is established, the treatment is readily decided upon.[1] Ergot is, as a rule, necessary, as the tendency to hæmorrhage from such events as the above-mentioned ones is due to want of tone in the uterine muscle, in other words to imperfect retraction.

In cases where these hæmorrhages are repeated, and treatment as above indicated is of no avail, the matter is more serious, and the disorder is most likely due to *retention of some part of the placenta or membranes.* If the after-birth has been carefully examined after labour, and its complete expulsion ascertained or effected, such an event cannot occur. The piece retained may give rise to very serious hæmorrhage, which is always from the placental site. This may persist either as frequently repeated bleedings, which exhaust the patient more or less rapidly, or less commonly as metrorrhagia appearing later on. The term **secondary hæmorrhage** has been applied to all bleedings which do not occur immediately after delivery, but do so before the process of involution of the uterus should normally have been complete.

Under this definition the bleeding from an inverted uterus (p. 486) is included, as also that due to new growths (see also Deciduoma Malignum below), but these are discussed elsewhere.

[1] Retroversion and flexion are often mentioned as causes of hæmorrhage under these circumstances. At the General Lying-in Hospital every woman's uterus and pelvis is examined about the thirteenth or fourteenth day, and it is interesting to note that about one-third of the cases have some retroversion, the fundus lying against the promontory ; and a quite appreciable number have the fundus lying in Douglas' pouch ; in neither case is there any resulting hæmorrhage.

All these severer kinds of hæmorrhage may merge into chronic conditions, and will then not be included under secondary hæmorrhage.

The *treatment* of free bleeding is to explore the interior of the uterus, and with the finger or a blunt curette, if necessary, gently detach any masses adhering to the wall. A very small bit of tissue is sometimes enough to prevent retraction.

Care must be taken not to mistake the placental site, which is convex inwards and rough, for an adherent piece of placenta.

The strictest antiseptic precautions are to be observed. (See treatment of retained portions of ovum in the chapters on puerperal fevers.)

Hæmorrhages may arise from the cervix at this time, but are very rare. They have been found due to ruptured varicose veins in this part of the uterus, to ulcerations (Spiegelberg), or to malignant disease.

Other Abnormalities of the Lochia.—Besides the excess of blood in the lochia just mentioned, this discharge may be *offensive*, or may *suddenly cease*.

In the former case care must be taken that the idiosyncrasies of odour of some women, especially of those of dark complexion, are remembered. Offensiveness is due to putrefaction. The commonest cause of this is the retention of portions of ovum : this has already been dealt with in discussing puerperal fevers, as well as the foul smell which occurs in febrile cases occasionally, the fever preceding the offensiveness. Decomposition may take place in pieces of the cervix which have been crushed or nearly torn off ; or by retention of lochia in a retroverted uterus (Spiegelberg).

Sudden cessation of the lochia usually happens in acute attacks of septic fever, or in other fevers, or may be due to retroversion of the heavy uterus, and retention of secretions in its interior as just mentioned.

Deciduoma Malignum

This name was given by Sänger to a form of malignant growth occurring in the uterus, and having the nature of a sarcoma. He called it by this name because it showed on microscopic examination numbers of cells like decidual cells (see p. 6) and also larger numbers of similar cells massed into plasmodia (the so-called syncytium). These masses and cells were found also in the secondary growths which occurred numerously in the lungs and other organs.

Since his case was described, many others have been reported ; but the later cases have no constancy in their characters, nor in the mode of origin ascribed to them. Some of them have been supposed to arise from sarcomatous degeneration of the villi of the chorion, and 'almost every malignant uterine growth discovered in the puerperium has been called "deciduoma" in Germany.'[1]

The most important point relied on by those describing such cases for

[1] Eden. For an account of the present state of opinion in England on this subject, the reader is referred to a most important series of papers published in the *Obstetrical Transactions*, vol. xxxviii., 1896, by Malcolm, Rutherford Morison, Spencer, and Eden ; to the discussion by Kanthack, Clarence Webster, and others ; and to the Report of a Committee in the same volume.

identifying them as 'deciduoma malignum,' is the presence of the syncytium above alluded to. Similar masses are, however, to be found in cases where there can be no question of any decidual tissue in or near the primary growth ; for instance, in sarcoma testis, one instance of which displayed the 'syncytium' most typically in the secondary growths in the liver and lymphatic glands.

It is clear that no well-defined class of tumour to which the name of deciduoma malignum can be with justice given exists, or has been demonstrated at present. The growths are to be looked upon as sarcomata occurring in the uterus during the puerperium.

Cases of vesicular mole have been recorded where a growth occurred in the uterine wall after the removal of the mole ; in both this and in the secondary deposits which were found the characteristic vesicular structure was evident.

Apart altogether from the theoretical aspect of the matter, the practical inference to be drawn from what has been made out on the subject of the sarcomatous growths above-mentioned, is that where there is hæmorrhage during the puerperal period which does not readily yield to treatment exploration of the uterus by the finger should on no account be omitted, and if a friable mass in the uterine wall is discovered, which on microscopic examination shows sarcomatous characters, the uterus should be excised without delay.

PATHOLOGY OF THE NEW-BORN CHILD

CHAPTER LXXVII

PATHOLOGY OF THE NEW-BORN CHILD

IT is proposed to give here only a short account of the diseases to which the newly-born child is liable. For a fuller treatment of the subject the reader is referred to works on the Diseases of Children.

NERVOUS SYSTEM

Occasionally a **paralysis** of one of the *facial nerves* is caused by the pressure of a blade of the forceps. The disturbance of balance in the features is not very marked as a rule, but it may be detected on careful examination. The condition lasts only a few days or weeks at most.

Fig. 392.—Paralysis of left side of face (drawn from a case in the General Lying-in Hospital).

The forceps is sometimes responsible for damage to the *brachial plexus*, when varying degrees of paralysis of the arm occur. The arm is more

commonly injured, however, by rough attempts to pull it down when it is extended above the head ; or by attempts at extraction of the body by hooking a finger in the axilla, the brachial plexus being thus damaged.

The prognosis in such cases is not very good ; but in slight cases improvement will be found in the course of months, or sometimes the paralysis may last over several years.

The arm should at first be kept at rest by being wrapped in cotton-wool and bandaged to the side. When the extravasated blood has been absorbed, which is usually in about three or four weeks, movement and galvanism should be employed.

Tetanus is very rare in the present day, and especially in this climate. It is caused by want of cleanliness as regards the navel.

Ophthalmia, due to **gonorrhœal** infection, has been mentioned as one of the possible results of want of care in cleansing the vagina in women, who, before labour, are found to have a purulent discharge.

The inflammation appears about the second day of life as a rule, and if untreated rapidly becomes very severe. The eyelids are very red and swollen, and there is considerable difficulty in separating them so as to get a view of the conjunctiva. The great danger is that the cornea may slough, and the eyeball shrink, total blindness resulting.

The means of prophylaxis are detailed on p. 240. When the disease has appeared, the important point in treatment is to keep the conjunctival sac as free as possible from discharge, which is constantly tending to collect under the eyelids ; and since the edges of the eyelids are gummed together by the dried pus, and also spasmodically contracted by reflex action, a certain amount of tension must be present, unless care is given to this point. This is best done by washing the eyes at least every hour with a dilute solution of corrosive sublimate (1-4000), or a saturated solution of boracic acid, until the discharge is reduced to a thin state, and the swelling of the eyelids disappears. It should then be done at less frequent intervals, until the eyes are well. If the case does not very soon yield to this treatment, a solution of nitrate of silver (10 or 15 grains to the ounce) should be brushed over the conjunctiva once a day. It is to be impressed on the nurse that the result depends in great measure on the diligence with which she uses the weak lotion, and if necessary an extra nurse should be obtained to carry on the treatment during the night.

Circulatory System

The occurrence of numerous **hæmorrhages** into the tissues of children, in whose birth there has been any difficulty, has been alluded to on p. 108. These are found in the **brain substance**, and on the surface beneath the **pia mater**. They are due to venous rupture in practically all cases, and are brought about either by pressure of the forceps or merely by congestion due to pressure on the umbilical cord. They are thus commoner in breech cases than in other presentations.

The child may survive, and die after a few days ; or it may be paralysed in correspondence with the seat of the damage done to the nerve-centres ; or it may possibly be affected in intelligence.

Cephalhæmatoma.—This is a hæmorrhage from the periosteum covering the skull, and is usually considered to be due to an intensification of the conditions which produce the caput succedaneum (p. 108). The blood may be effused beneath the occipito-frontalis tendon in rare cases, but its commonest seat is beneath the periosteum. In this last case it cannot extend beyond the edge of the particular bone over which it occurs. The swelling in nearly all instances is found in the situation of the caput succedaneum. It is, however, occasionally double, and a specimen of this condition (double) was shown at the Obstetrical Society quite recently.[1] There is usually a ridge found round the edge of the swelling after it has begun to be absorbed; this is no doubt due to the deposition of bone by the lower surface of the periosteum. The lump often becomes quite hard and bony. It takes several months to disappear entirely.

A cephalhæmatoma is distinguished from a caput succedaneum by its fluctuation, its persistence beyond a day or two, and its limitation by the edges of the bone over which it lies; and from a meningocele by the latter being seated over a fontanelle or suture, and swelling when the child cries.

As far as the blood tumour is concerned the prognosis is good; but it may be complicated by hæmorrhages into deeper tissues.

Hæmorrhages may occur into the **lungs** and into the **kidneys**, and cause symptoms; in the former case, Spencer (quoted on p. 109) found that it was usually into the base, and if the child survives, pneumonia may affect this part; in the latter the same observer found that suppression of urine might occur.

A hæmorrhage may occasionally take place into the sterno-mastoid muscle, after attempts to extract the after-coming head. It is usually situated in the upper part of the muscle. There is a tumour to be seen and felt, of much variety in size and shape. It disappears after a few weeks: but it is to be remembered that it may, owing to destruction of the muscular tissue, lead to subsequent wry-neck.

Hæmophilia neonatorum.—A tendency to bleed may show itself within a few days of birth by hæmorrhages from the nose, stomach, intestines, and kidneys, and from subcutaneous vessels. In a large majority of cases the child is found to suffer from syphilis or septicæmia or both.[2]

Congenital heart-diseases show themselves in all cases at this period of life by cyanosis in varying degrees. The varieties are numerous, and their diagnosis almost impossible, but the treatment usually necessary is the same in all instances, namely to keep the child constantly warm. These cases must be distinguished from cases of atelectasis pulmonum, which causes the same appearance. The cardiac condition persists, while the pulmonary disorder is either accompanied by other conditions of debility in the child, and takes part in causing its death; or gradually clears up as the child gets stronger and the lungs expand completely.

Icterus neonatorum.—A slight degree of yellowness of the skin is almost the rule during the first ten days or so of the life of a new-born child, and may be demonstrated by pressure on the surface so as to make it

[1] Wheaton, *Obst. Trans.*, vol. xxxv. p. 6.

[2] Ashby and Wright, *Diseases of Children.*

anæmic. A yellowness sufficient to be at once recognised occurs in about 25 per cent. of all cases. There is never more than very slight discolouration of the sclerotics, and in the large majority of cases these remain quite unaffected, even when the skin shows unmistakable signs.

The discolouration of the skin appears about the second or third day, gradually becomes more intense, and lasts about a week. The urine is not affected in the milder cases, and the normal amount of bile-pigment appears in the motions. The health of the child is not affected unless the jaundice is more severe; but in this event the symptom is probably due to a more serious condition than in the commoner kind. It has been said by some that those children on whom late ligature of the cord has been practised (see p. 193) are more liable to be yellow than others; but the result in a series of cases in the General Lying-in Hospital in which in 50 cases the cord was, contrary to the usual practice there, ligatured early, was that these cases were the subjects of icterus with rather more frequency than the rest of the cases.[1]

Quite in consonance with this fact is the experience that premature children are much more frequently coloured than those born at term; and that children which are weakly from any other cause, without having any disease which directly induces jaundice, are almost universally yellow. In contrast with the insignificance of this condition, which is icterus neonatorum *par excellence*, the jaundice which is found to accompany *septicæmia* in the newly born is an extremely grave symptom. Jaundice occurs also in two other diseases, which are, however, very rare—namely, *Winckel's disease* and the *Acute fatty degeneration of the New-born*, described by Buhl.[2] Jaundice may also be due to actual diseases of the liver, as in the perihepatitis of syphilitic children; or to some congenital malformation of the biliary ducts. Finally, in very rare cases a child may have jaundice and die on the ninth or tenth day without any disease being discoverable post-mortem.

There are many theories to account for the simple jaundice first described. It is certain that there is a considerable change in the histological elements of the blood soon after birth. The disintegration of some of the corpuscles which then takes place must set free a certain amount of hæmoglobin, and if this is not soon reabsorbed (by the remaining corpuscles) or altered or excreted by some organ, it is probable enough that it may be deposited in the tissues and stain them yellow. The fact that there is no excess of bile-pigment in the urine, and no lack of it in the motions, supports this view. Another hypothesis is that the ductus venosus may remain patent in some cases rather longer than in others (p. 236). In this case the portal blood, not having passed through the liver and got rid of its bile-pigment, runs straight through into the general circulation.

As regards diagnosis between the harmless kind and the severe symptomatic kinds, the child has only to be watched, and the absence of any possible cause for septicæmia and of the symptoms belonging to the

[1] See also Schmidt, *Arch. f. Gyn.*, vol. xlv., 1894, who is quoted on p. 194.

[2] For these conditions, works on the Diseases of Children should be consulted.

other diseases mentioned as causes of jaundice will indicate the nature of the case.

No treatment of the cases which merely suffer from discolouration of the skin is necessary.

Alimentary System

The only disturbance of the functions of the alimentary canal which can be called congenital is the condition of imperforate anus. This need only be mentioned here, since its treatment is surgical.

During the first fortnight or even earlier in the child's life it may suffer from some form of digestive disturbance. The commonest are flatulence and colic. These mild troubles may be remedied by attending to the principles mentioned at p. 240, and need not be further alluded to here.

Thrush.—There is, however, one disease which will come more especially under the notice of the obstetrician—namely, *aphthous stomatitis*. This disease is always found in connection with a weakly condition of the child. It consists of the growth of a fungus (oïdium albicans) in the epithelium of the mouth. The appearance produced is that of small white patches on the tongue, the inside of the cheeks, the lips, and the soft palate. The patches are sometimes surrounded by an area of redness, but the mucous membrane around them may be quite normal in appearance. They are distinguished from particles of curd by their being firmly adherent to the surface. In a few cases the fungous patches have been found further down the alimentary canal, in the stomach and intestines. They have been seen in the lungs also. The frequent statement of women of the lower classes that the 'thrush has gone right through' the child is, however, not to be accepted, for the diarrhœa which so frequently accompanies the mouth-symptoms, and which presumably suggests this progressive invasion of the digestive system, is probably the cause, or at most the accompaniment of the disease, and not the result.

The patches are not found to grow in the mouths of those children who are carefully looked after, and are attended to after each time they have taken the breast (see p. 232). When they occur, the mouth must be swabbed out frequently, immediately after each meal, and in the intervals, with a strong solution of borax (half a drachm to a drachm to the ounce). The great point is to improve the child's health as quickly as possible.

Skin and Subcutaneous Tissue

The newly-born child is not liable to many diseases of the skin. The commonest is a form of *lichen*, '*red gum*,' which is by most believed to be produced by digestive disturbance, and by others to be the result of sweating freely. In later months it concurs with the eruption of a tooth. It causes some irritation to the child. It may be treated by dabbing on a weak lotion of lead, or by powdering the skin with a mixture of starch and oxide of zinc, and at the same time attending to any signs of indigestion.

Pemphigus is found in cases of congenital syphilis.

Sclerema Neonatorum.—This is a rare disease. It is characterised by a

hardening of the skin and subcutaneous tissue, which begins as a rule in the lower extremities and gradually involves the skin over the whole body. The child wastes, and has a very low temperature (between 80° and 90°). The disease begins a few days after birth, and the child nearly always dies within a few days more. The cheeks and tissues round the mouth are rendered so stiff that the child cannot suck, and the limbs are made quite rigid in the severest cases. No very definite changes have been found in the tissues on microscopical examination.

General Œdema.—This has been mentioned as an intra-uterine disease, or perhaps it should rather be called symptom, for it may occur in connection with diseases of the kidneys, or with some interference with the venous return of blood.

Diseases of the Navel

Inflammation and Ulceration may occur in cases where there has not been sufficient care taken to protect the surface left after separation of the stump of the cord from septic infection. This disease used to be very common in lying-in hospitals before the principles of antiseptics were understood and observed. It is hardly ever seen now, and never need be. Cleanliness and antiseptic measures are all that is required in the way of treatment. Formerly the complaint used to go on to sloughing, and when it was sufficiently severe for this the child invariably died. The disease sometimes affects the vessels mainly, and suppurative changes may spread inwards.

In rare cases the navel refuses to heal because there is a *persistence of the vitelline duct* (*Meckel's diverticulum*), which then opens on the surface of the navel. A polypoid mass is sometimes found, and this, on section, is seen to have a central canal, lined with a mucous membrane similar to that of the small intestine.[1] *The urachus* has been found to *remain patent* at its umbilical end.

Hæmorrhage from the navel sometimes occurs shortly after birth, and is then due to careless tying of the cord. It is easily arrested by putting on a fresh ligature.

A more dangerous kind of bleeding may take place after the stump has separated. The commonest time for this bleeding to occur is about the ninth day. It is always an oozing from the surface. The child is as a rule a healthy one, though of three cases seen by the author, the child in one was born of a hæmophilic family, and had numerous bruises, some of large (1½ inch in radius) size scattered over the surface of its body; and another was born of a mother who had had thrombosis at previous labours, and in whose left radial vein there was a phlebolith remaining, and who also had thrombosis of her external saphenous vein at the time she was under observation. The child had a 'show' from the vagina on the eighth day (see p. 239), and began to bleed from the navel on the ninth. The third was, as far as could be seen, born of healthy parents, and had no other bad symptom. In all probability, the bleeding is due to some constitutional cause. Jaundice is often found in connection with the bleeding;

[1] See a case shown by Wheaton, *Obst. Trans.* vol. xxxiv. p. 184.

but jaundice is so common that its occurrence simultaneously with bleeding is very likely nothing but a coincidence. Septicæmia has been found in connection with the bleeding, and so has 'fatty degeneration of the new-born.'

There is only one kind of treatment that is of the least avail, and that should be employed at once, for children of this age cannot bear the loss of even very small quantities of blood without danger. The treatment is to under-run the navel with a hare-lip pin, or a long needle, and apply a figure-of-eight ligature over it, as described in Rupture of Cord (p. 518). If the navel is pinched up by the finger and thumb of the left hand while the child is inspiring, and the abdominal walls are relaxed, there is no danger of wounding intestine, which is thus kept out of the way. The ordinary methods recommended are pads, styptics, and filling the navel with plaster of Paris.

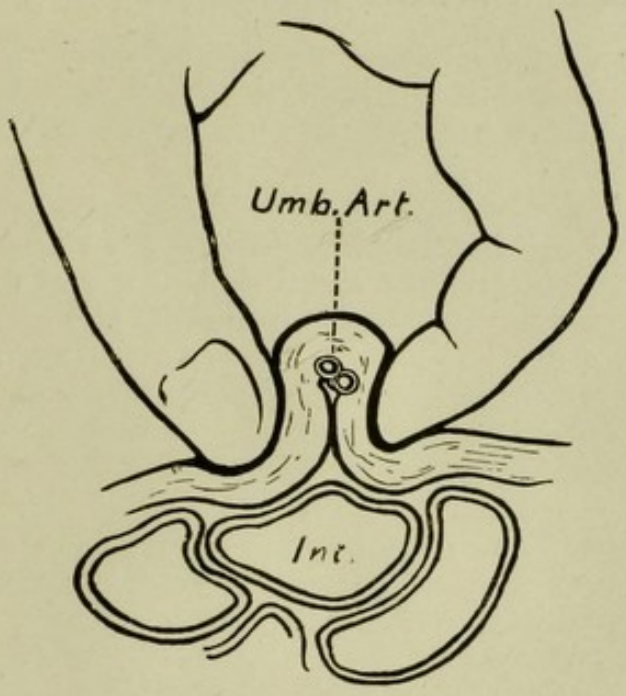

Fig. 393.—Isolation of umbilical vessels by finger and thumb. *Int.* intestine.

These are of no avail, and if the medical man cannot be at once obtained, the nurse must pinch the navel between her finger and thumb, and thus arrest the bleeding until he comes.

Congenital Umbilical Hernia. Ectopia Viscerum.—The abdominal contents are sometimes found to be extruded in a sac of peritoneum and amnion. This requires surgical treatment, which is, however, rarely successful.

Syphilis.—The signs of congenital syphilis are very often absent during the first two months or so of independent life, but some infants are born which show more or less unmistakable signs at the moment of birth. The child may survive its birth for a few hours only, and in this case it is usually a shrivelled-up, yellow little object, with a hoarse cry. The commonest sign is perhaps pemphigus, which shows itself first on the buttocks, or the child may be born with pemphigus on its palms or soles (p. 269). There

may be interstitial hepatitis and jaundice. It is not uncommon to find in children which afterwards show distinct signs of syphilis, that there is some deficiency in the ossification of the bones of the cranial vault, and the bones are over a large area found to be replaced by membrane.

One form of treatment at this age is by inunction of a minute quantity of blue ointment (half a grain to a grain night and morning). It is best smeared on under the flannel binder, and the place of its application under this can be frequently varied. Better, perhaps, is Baginsky's method of giving a sublimate bath, containing ten grains of perchloride of mercury (about 1–4000) in which the child is to remain for five minutes. Care is to be taken that none of the solution gets into its mouth.

Or the mercury may be given internally in half-grain doses of hyd. c. cret. The child's strength must be well supported, and a few drops of cod-liver oil or some iodide of iron may be given.

APPENDIX

A. THROMBUS VAGINÆ, HÆMATOMA OF VULVA

THIS is an effusion of blood into the connective tissue beneath the mucous membrane of the vagina, usually affecting only the lower end; or into one of the labia majora; or in both situations. The term 'thrombus' is, according to modern nomenclature, incorrect.

Causation.—What is supposed by many to be a predisposing cause of this condition—namely, a varicose state of the veins of the labia majora and lower end of the vagina—is mentioned on page 283. It is found, however, that extravasation occurs in a large proportion of cases in the absence of varicosity. It is a rare accident—one of the rarest in midwifery practice.

The actual cause, apart from injury (which may produce a hæmatoma during pregnancy), appears during labour in the increased tension brought about in the vessels of the part by the pressure of the descending head and the strain during bearing-down.

When the blood has been effused in the situations named, it may travel, according to the amount of tension in the effusion, to varying distances, and separates the planes of fascia as it advances. Its path is marked out by the anatomy of the fascia in its neighbourhood. If the blood is effused into the labia it may travel beneath the superficial fascia up on to the abdominal wall. If it is effused above the level of the visceral layer of the pelvic fascia, it will travel along the planes of the tissue above this, not descending into the ischio-rectal fossa nor the labium.

The commoner site is below the pelvic fascia. Here the swelling produced may be quite small and of no importance, or it may be very extensive and the woman may be in danger from loss of blood.

An elastic, tense swelling, of a dark purple colour, is found on one side of the vulva. It may block the vaginal orifice.

The tension of the mass may be enough to check the bleeding after a varying amount of blood has been effused; or the blood may travel for an indefinite distance in the abdominal wall; or the enclosing skin and tissues may give way, and the blood escape at the surface. The effusion gives rise to considerable pain of a tearing character, and the woman may be rendered faint if the loss of blood is sufficient, whether there is an external opening or not.

Later, in cases where external rupture has occurred, the wound may suppurate, and grave septic symptoms may arise.

Treatment.—Where the effusion is small the child must be rapidly extracted by the forceps, unless it is just on the point of being born. If the tumour formed is large enough to prevent the passage of the head an incision must be made, and the

contents evacuated; and directly the labour is over the cavity must be filled with iodoform gauze or some other antiseptic material, every antiseptic care being practised. While the head and trunk of the child are passing over the bleeding point, their pressure will be enough to check the hæmorrhage.

The plug may be removed in twenty-four hours, and a pad of the same material employed to make firm pressure until all bleeding has ceased, when the wound can be dressed simply.

Prognosis.—According to statistics this is not particularly good. Some observers have found the mortality to be as much as 12 per cent. At the present day, apart from the risks of hæmorrhage which a woman would run before she was assisted, there would be little or none arising from the septicæmia which played so large a part in the mortality of former days.

B. "WALCHER'S POSITION."

This position is of distinct use in increasing the conjugate diameter of the pelvis where it is necessary to extract with the forceps in flat or generally contracted flat pelves.

The swinging movement of the sacrum in labour was described long ago by Matthews Duncan, and others, and is alluded to on page 86.

In the attitude now under consideration, a gain of six to eight millimetres (over one-fifth of an inch) was found by Fehling to be made,[1] and one of about one-fourth of an inch by Jewett.[2] Walcher deserves the credit of having pointed out the importance of attitude in this particular case, and he found the gain to be as much as 1·3 centimetre.[3]

Description.—When it is time for the head to come through the brim, the woman is brought to the edge of the bed or table. She lies on her back with the thighs unsupported and hyper-extended. This over-extends the innominate bones on the sacrum, the movement taking place at the sacro-iliac synchondrosis, and separating the symphysis from the promontories. It will be found very useful to pass a band behind the back and under the axillæ, and to secure this above the patient's head.

After the brim has been passed, it is better to put the woman in the ordinary obstetric position, since during the passage of the outlet flexion of the pelvis on the spine increases the antero-posterior diameter of that pelvic strait.

[1] *Münchener med. Wochenschrift*, 1894, No. 44.
[2] *Brooklyn Medical Journal*, 1894, No. 11.
[3] *Centralblatt. f. Gyn.* 1889, p. 892.

INDEX OF AUTHORS

REFERRED TO IN TEXT

* *Means that an illustration is borrowed*

Ahlfeld, 65
Altmann, 575
Ashby (and Wright), 238*, 243, 581
Auvard, 24, 50*, 165, 293, 501

Bandl, 45
Barbour, 48, 121*, 122, 209, 210
Barlow, 267
Barnes, R., 269, 343, 349, 370, 483
Baudelocque, 121
Becquerel (and Vernois), 575
Bowlby, 267
Boxall, 183, 503, 528, 545, 546
Breslau (and Eberth), 256
Brieger, 528
Budin, 67
Budin (and Chavane), 243
Buhl, 582

Cameron, 396*, 398
Cayley, 547
Champneys, 58, 123, 125, 127, 398, 520
Chantreuil (and Tarnier), 57
Charpentier, 205, 208
Chavane (and Budin), 243
Cheyne, Watson, 526, 545
Clouston, 556
Cohnheim, 506
Cornil (and Ranvier), 266
Crédé, 240
Crédé (and Leopold), 153
Cullingworth, 182, 375*, 537
Curatulo, 299
Curschmann, 301
Cutler (and Probyn-Williams), 220*, 221, 222, 503

Denman, 469
Depaul, 455
Dohrn, 57, 237, 287
Doléris, 527
Doléris (and Butte), 509
Donald, 392
Douglas, 470
Duhrssen, 355
Duka, 182
Duncan Matthews, 34, 65, 71, 100, 123, 126, 202, 222, 248, 257, 286, 298, 299, 414, 479, 502, 533, 537, 545, 568, Appendix

Eberth (and Breslau), 256
Eden, 11, 26*, 27*, 250*, 307*, 308*, 577
Engelmann (and Kundrat), 5*

Fagge, Hilton, 266, 301
Farre, 36
Fehleisen, 543
Fehling, 299, and Appendix
Fischel, 223
Franque, von, 527
Friedländer, 18, 43
Fuller, 71

Galabin, 66, 74, 369, 382, 483, 512
Garrigues, 404
Garrod, 57
Gassner, 217
Gautier, 565
Giles, 55, 217
Graefe, 283
Griffith, W. S. A., 325
Grün, 316
Guyon, 225*

Hart, Berry, 118
Hecker, 65, 156
Hélie, 41
Helme, 41, 43, 214
Hennig, 317
Herman, 57, 145, 198, 334, 413, 419, 426, 465, 506, 509
Hicks, Braxton, 38, 289, 367, 369, 511, 544
Hildebrandt, 261
Hofmeier, 288, 299, 455
Hoggan, 44
Horrocks, 361*
Hunter, John, 42
Hunter, William, 6
Hypolitte, 57

Jaksch, von, 531
Jessop, 319
Jungbluth, 19

King, 334
Kitasato, 565
Kiwisch, 363

Klein, 543
Kölliker, 41
Krönig, 542
Kuchenmeister, 287
Kundrat (and Engelmann), 5*

Lamy, 564
Lemser, 124
Leopold, 262, 399, 542
Leopold (and Crédé), 153
Lockwood, 539
Löwenhardt, 65
Lusk, 208

McCann, 281
McCann (and Turner), 222, 223
McClintock, 258
Maguire, 507
Martin (and Ruge), 237, 239
Mathiesen, 334
May (and Wigand), 370
Mayor, 62
Menge, 255
Mermann, 542
Meyer, 545
Minot, 12*, 13*, 14*
Money, Angel, 219
Montgomery, 54
Morisani, 402
Münchmeyer, 486

Nägele, 135, 433, 445
Nettleship, 566
Neugebauer, 452
Neumann, 262
Noeggerath, 542

Osborn, 392

Parrot, 266
Perls (and Weissgerber), 506
Pestalozza, 121
Phillips, C. N., 543
Phillips, John, 337, 513
Pinard (and Varnier), 145*, 210, 259*
Playfair, 181
Polk, 48
Popow, 4
Porak, 206
Probyn-Williams (and Cutler), 220*, 221, 222, 503

Ralfe, 507
Ranvier (and Cornil), 266
Rasch, 299
Robinson, 506
Rokitansky, 57
Rotch, 218
Roux, 565
Ruge (and Martin), 237, 239
Runeberg, 505

Sänger, 399, 542
Savage, 556, 557
Schatz, 199, 294
Schauta, 299, 330
Schimmelbusch, 352
Schmidt, 194, 238
Schultze, 121
Semmelweis, 181, 182
Sigault, 402
Simpson, 372
Sinclair, 261
Slavjansky, 261
Smellie, 372
Smith, Tyler, 34, 117
Spencer, Herbert, 108, 346
Spiegelberg, 76, 128, 145, 204, 214, 222, 280, 415, 491
Stadtfeldt, 65
Sutton, Bland, 267, 317, 318, 322
Sutugin, 66

Tait, E. S., 222
Tanner, 36
Targett, 452
Tarnier, 279
Tarnier (and Chantreuil), 57
Teufel, 257
Trautmann, 394
Turner (and McCann), 222, 223

Vaillard, 565
Varnier (and Pinard), 145*, 210, 259*
Vernois (and Becquerel) 575
Vinay, 300
Virchow, 237, 261
Voit, 510

Walcher, Appendix
Watson, Sir Thomas, 301
Weber, 301
Webster, Clarence, 7, 37*, 48, 208, 209, 210*, 314
Weissgerber (and Perls), 506
Weit, 65
Werth, 333
Wheaton, 581, 584
Wigand (and May), 370
Williams, Sir John, 43, 215, 217, 509
Winckel, 57, 210, 222, 223
Wintrich, 287
Wolff, 32
Wright (and Ashby), 238*, 243, 581

INDEX

Abdomen, fœtal, enlargement of, 465
pain in, during labour, 109
pregnancy, 287
pendulous, 271, 427
in pregnancy, appearance of, 60
auscultation of, 61
enlargement of, 60
examination of, 60
pain in, 287
palpation of, 60
pigmentation of, 57
position of uterus in, 39
shape in transverse lies, 471
skin of, 51
striæ of, 51, 69
in puerperal state, 222
section of, see Cæsarian Section, Ectopic Gestation
section of, for rupture of uterus, 399
Abdominal bandage in anteversion, 271
after delivery, 229
cavity, escape of fœtus into, 320
examination, 150
fœtation, see Ectopic Gestation
tumours, diagnosis of, from pregnancy, 69, 70
muscles, action of, in labour, 100, 126
palpation in pregnancy, 60
palpation in labour, 141, 142, 143, 150, 157, 160, 161, 169, 173, 174, 175
pregnancy, see Ectopic Gestation
pressure, use of, in breech cases, 200
section, see Cæsarean Section, Ectopic Gestation, and Rupture of Uterus
tumours, see also Fibroid, Ovarian Cyst
tumours, diagnosis from pregnancy, 69, 70
walls after labour, 215
during pregnancy, 50
increase of fat in, during pregnancy, 51
striæ of, 51, 69
Abnormal uterine action, see Inertia, Tetanus, &c., and Uterus
Abnormalities of uterus in pregnancy, 75
Abortion, 303
in albuminuria, 507
anæmia, 283
arrest of threatened, 310
artificial induction of, 440
in albuminuria, 508
in cancer of cervix, 290
Abortion, artificial induction of, in chorea, 282
in contracted pelvis, 439
in eclampsia, 512
in icterus, 286
methods of, 362, 365
in pernicious anæmia, 283
in placental prævia, 346
in retroversion of gravid uterus, 277
bleeding in, 305
causes of, 304
decomposition of remains of ovum after, 308
definition of, 303
diagnosis of, 309
ergot in, 310
exploration of uterus after, 312
'habitual,' 304
hæmorrhage in, 305
after, 307
incomplete, 307
indications of, 307
results of, 308, 309
inevitable, 306
management of incomplete, 312
of inevitable, 310
of threatened, 310
missed, 250, 251
ovum in, 304
pain in, 306
placenta, expulsion of, in, 305
premonitory symptoms of, 306
recurrent, causes of, 304
remnants left in uterus after, 307
retention of membranes, 307
placenta, 307
septicæmia after, 308, 313
sequelæ of, 309
subinvolution after, 309
symptoms of, 306
tents in, 310
tetanus after, 309
threatened, 306
uterus after, 305
vaginal plug in, 311
chorionic villi in diagnosis of, 309
Abscess of breast, 571
mammary, 571
in mastitis, 571
in puerperal fever, parametric, 533
in phlegmasia dolens, 554
pelvic, 533, 535, 537
sub-mammary, 573

Acardiac fœtus, 74
Accessory placenta, 23
Accidental complications of pregnancy, 287, 296
hæmorrhage, 336
diagnosis of, 338
Acetone in urine, 222
Acid carbolic, 184, 227
compatibles with, 183
Acini of breast, 53, 217
Acormi, 74
Acute yellow atrophy in pregnancy, 284, 286
Adaptation of fœtus to uterus, 34
fœtal head to birth-canal, 95
Adhesion of fœtus to amnion, 259, 260
placenta, 260
of membranes, causing delay in first stage, 188
of placenta, 261, 479
Adult circulation, establishment of, 235
Æquabiliter justo-minor pelvis, 425
Aëration of fœtal blood, 22
After-birth (see Placenta and Membranes)
period of (see Third Stage &c.)
After-coming head, application of forceps to, 202
in contracted pelvis, 443
danger in, 178
delivery of, mechanism, 172
extraction of, 201
perforation of, 387
After-pains, 217
prevention of, 231
treatment of, 231
Agalactia, 575
Age, fœtal, how estimated, 65, 66
influence of, on labour, 127
child's head, 440
Ague in pregnancy, 301
Air, entrance of, into uterus, causes, 502
veins, causes, 555
Air-embolism, 555
Air-vesicles, rupture of, during labour, 502
Albumin in colostrum, 218
liquor amnii, 19, 20
milk, 218
urine, 57, 504
Albuminuria, abortion due to, 507
death of fœtus from, 507
diagnosis of, 508
during pregnancy, 57, 504
in eclampsia, 507, 508
in hydramnios, 506
in new-born child, 237
induction of abortion in, 508
prognosis of, 508
symptoms of, 507
treatment of, 508
in puerperal insanity, 507, 556
Alcohol in insanity, 561
puerperal fever, 531
Alimentary system in pregnancy, 57
Allantois, formation of, 9
Amenorrhœa of pregnancy, 58
pregnancy commencing during, 59
Ammonia, carbonate of, in treatment of pulmonary embolism, 552
Amnii, liquor, see Liquor Amnii
Amnio-chorionic fluid, 29
causing two bags of membranes, 114
Amnion, 8, 19
adhesions of, to fœtus, 259, 260
affections of, 257
development of, 8
dropsy of, 257
fluid of, 19
formation of, 8
pathology of, 257
Amnion prolapse of, 114
relations of, to placenta, 16
sac of, 18
separation from chorion, 114, 125
at term, 19
Amnions, two, in multiple pregnancy, 73
Amnionic bands causing amputation of limbs, 260
Amnionic cavity, dropsy of, 257
Amnionic fluid (and see Liquor Amnii), 19
absorption of, after fœtal death, 270
anomalies of, 257, 259
characters of, 19
composition of, 19
deficiency of, 259
discolouration of, 29, 257
excess of, 257
source of, 19
uses of, 20
variations of, 29
Amount of blood lost at labour, 127
Ampullary layer of decidua, 7, 16, 247
Amputation of fœtal limbs by amnionic bands, 259, 267
Amputation, spontaneous intra-uterine, 267
Anæmia acute, see Placenta Previa, Post-partum Hæmorrhage
Anæmia as contra-indication to lactation, 232
during pregnancy, 56, 282
of mother, causing abortion, 283
necessitating abortion, 283
pernicious, 282
transfusion in, 340, 360
treatment of, after placenta previa, 350
Anæsthesia, 205
during labour, 192, 205
in first stage, 206
in second stage, 192, 206
in third stage, 206
in eclampsia, 512
effect on pains, 192
child, 206
in operations, 206
Anal fascia, 89
Anasarca, see Œdema and Dropsy
Anatomy, see under several headings of 'Pelvis,' 'Uterus,' 'Labour,' &c.
Anencephalus, 263
Animation, suspended, of fœtus, see Still-birth
Annular laceration of the portio vaginalis, 494
Anomalies of cord, 27, 262
expulsive force, 410
membranes, 246, 252, 257
ovum, obstructing labour, 461
pains, 411
pelvis, 415
uterus, 293
Anorexia in pregnancy, 55
Anteflexion of gravid uterus, 271
normal, 39
in puerperal state, 208
Ante-partum hæmorrhage, see Hæmorrhage
Anterior fontanelle, 92
lip of cervix during labour, 115, 190
parietal obliquity, see Nägele Obliquity
Ante-version in pregnancy, 39, 271
Antipyrin in after-pains, 231
Antiseptic douching after labour, cases where necessary, 226
Antiseptics, 181
drugs, 183
incompatible, 183
in labour, 181, 197
in puerperium, 226
Anus, condition during labour, 118
imperforate, 583

Anus, laceration of sphincter of, 498
traction on after-coming head through, 201
Aorta, compression of, for post-partum hæmorrhage, 485
Aorta, pulsation of, in abdominal examination, 63
Aortic disease in labour, 503
Apex of heart, change of position in puerperium, 218
Aphthous stomatitis, 583
Apnœa, in new-born child, 519
Apoplexy, diagnosis from eclampsia, 511
during pregnancy, 507
of decidua, 248
of ovum, 248
in ectopic gestation, 322
Appetite during pregnancy, 55
Arantius, ductus venosus of, 235
Arch, pubic, see Anatomy of Pelvis, p. 81
relation of fœtal head to, in labour, 138, 191
Area of safe attachment of placenta, 342
Areola, changes in, during pregnancy, 53
sebaceous follicles of, 53
secondary, 54
Arm, dorsal displacement of, 475
presentation of, 472
prolapse of, 472
with head, 475
in transverse presentations, 472
Arms in normal labour, breech, 172
vertex, 139
liberation of, 200
Arterial pressure during puerperium, 220
Arteries of cord, 21
'curling,' 14
errant, 24
placental, thickening of walls of, 26
thrombosis of, 26
pulmonary, embolism of, 551
in fœtal circulation, 235
thrombosis of, 550
umbilical, 21
uterine, after delivery, 214
in pregnancy, 42
of villi, 14
endarteritis of 26
thrombosis of, 26
Articulations, ilio-sacral, 86
in pregnancy, 49
rupture of, 501
pelvic, 86
after labour, 215
changes in during pregnancy, 48
injury to, in labour, 501
laxity of, in pregnancy, 48
in puerperium, 568
rupture of, 501
sacro-coccygeal, 86
pubic, 86
in pregnancy, 48
puerperium, 568
Artificial abortion, 440
feeding of infants, 242
human milk, 242
premature labour, 440
respiration, 520
rupture of membranes, 189
Ascites in diagnosis of pregnancy, 59, 60
fœtal, 265
obstructing labour, 465
Asepsis in midwifery, 181, 226
Asphyxia in air-embolism, 555
embolism of pulmonary artery, 551
thrombosis of pulmonary artery, 550
fœtal, in breech presentations, 178, 519
Asphyxia, fœtal, in delayed delivery, 430
pelvic contraction, 430
coiling, twisting of cord, 262
neonatorum, causes, 519
diagnosis, 519
livida, 519, 520
pallida, 519, 523
Schultze on, 521
symptoms, 519
treatment, 520
varieties, 519
Aspiration of blood by fœtus, 193
Asses' milk, 242
Asymmetry of head after labour, 144, 149
pelvis, see Pelvis
Asynclitism, 135, 433
Atelectasis pulmonum, 523
Atmosphere as cause of illness in puerperium, 526
Atony of placental site, 487
uterus, 411
Atresia of cervix, 455
vagina, 458
Atrophy, acute, of liver in pregnancy, 284, 286
Attitude, fœtal, 32, 163
abnormal, 168, 474
causation of special, in extension, 154, 165, 169
effect of, on labour, 474
maternal, in pregnancy, 60
in rectification of malposition of fœtus, 197, 199
in rectification of uterus, 441
Walcher's, see Appendix
of woman for labour (English), 186
Auscultation of abdomen, 61
of air in heart, 555
in breech presentations, 169
in diagnosis of fœtal positions, 151, 152
of life or death of fœtus, 62, 270
of pregnancy, 61
-sounds heard over abdomen in, 61, 62, 63
Auto-transfusion, 485
Auxiliary muscles of labour, 100
forces in labour, description of, 100
inefficiency of, 414
Average amount of blood lost at labour, 127
duration of labour, 127, 186
Axillary lumps, 58
Axis of fœtus, 79, 90
of parturient canal, 80
of pelvis, 80
- pressure on fœtus, 103
causing flexion, 133
- traction, 374
forceps, 374
of traction with forceps, 374, 381
of uterus, 150
obliquity of, 41, 154, 197, 199

Bacilli, see Micro-organisms
Back, relations of fœtal to maternal parts, see Special Mechanisms
Bag, dilating, of Barnes, 349, 358
of Champetier de Ribes, 359
of membranes, see Membranes, 104
Ballottement of fœtal head, 61
of fœtus, 64
Bandage, abdominal, after delivery, 229

Bandage, abdominal, in anteversion of uterus, 273
during labour, 339, 473
pelvic, 501, 568
Bandl, ring of, 98, 118, 410
Bands, amniotic, 259
Barnes' bags, 349, 358
Bath for new-born child, 240
Battledore placenta, 27
Baudelocque, diameter of, 417
Bedroom of lying-in woman, 180
Belladonna in arrest of lactation, 233
phlegmasia dolens, 554
Bilobed uterus, 293
effect on presentation, 293
Bimanual compression of uterus in post-partum hæmorrhage, 484
Bimanual examination of uterus in pregnancy, 63
Bimanual version, 367
Binder, abdominal, see also Bandage, 229
application of, 229
Biparietal obliquity, 135, 433
Bipolar version, 367
in placenta prævia, 349
shoulder presentations, 473
Bladder after labour, 212, 230
anatomy during labour, 115, 118
aspiration of, in retroversion of gravid uterus, 276
calculus in, 460
care of, in labour and child-bed, 189, 230
condition of, during first stage, 115
second stage, 118
pregnancy, 49
distended, causing inertia, 411
in retroversion of gravid uterus, 275
fœtal, fulness of, at birth, 19
inflammation of, after delivery, 566
with retroversion of gravid uterus, 275
injury to, with pelvic contraction, 429
irrigation of, in cystitis, 567
obstructing labour, 411
puncture of, 276
relations of, during pregnancy, 49
sloughing of, in retroversion of pregnant uterus, 275
stone in, 460
symptoms, with incarcerated uterus, 274
Blastodermic membrane, 7
Bleeding (venesection) for eclampsia, 513. Also see Hæmorrhage
Blindness in lactation, 566
in pregnancy, 507
Blood, amount lost during labour, 127
aspiration of, by fœtus, 193
changes in, during pregnancy, 56
in puerperium, 220
diseases of, in pregnancy, 282
causing abortion, 283
effusions of in fœtus during delivery, 108, 580
transfusion of, 360
Blood-mole, 248
Blood-pressure in puerperium, 220
Blood-vessels, entrance of air into, 555
of placenta, see Placenta
uterine, changes in, in pregnancy, 42
'Blue' asphyxia, 519
Blunt hook in impacted breech presentation, 474
version, 369
Body of uterus, isthmus of, 42
lower segment of, 42, 98
upper segment of, 98
Body-weight of child, affected by ligature of cord, 193, 238
daily increase in, 238
loss of, after birth, 238
effect on developing pelvis, 421, 422, 423
Bones, cranial, overlapping of, in labour, 92
excessive, in deformed pelves, 431
fœtal, changes in, in intra-uterine rickets, 266
in sporadic cretinism, 266
in syphilis, 265
fractures of, intra-uterine, 267
histology in cretinism, 266
in rickets, 266
parietal, fracture of, 431
pelvic, softening of, in osteomalacia, 449
Bottle for infant feeding, 244
cleansing of, 244
frequency of administration, 244
Bougie in induction of labour, 364
Bowels, action of, post partum, 222, 230
Brain, fœtal, destruction of, after perforation, 388
hæmorrhages into, 580
Braun's colpeurynter, 363
Braxton Hicks's cephalotribe, 388
method of version, 367
in placenta prævia, 349
Breast-pump, 570, 571, 573
Breasts, abscess of, 571, 572
acini of, in pregnancy, 53
areola of, in pregnancy, 53
in puerperal state, 217, 231
secondary, 53
bandage of, 233
care of, in puerperal state, 232
changes in, in pregnancy, 52
puerperal state, 217
colostrum in, after labour, 217
during pregnancy, 53
diseases of, 569
abscess, 571, 572
causes of, 572
galactocele, 574
galactorrhœa, 574
inflammation of, 571
mastitis, 571
varieties of, 572
nipples, fissured, 570
retracted, 569
sore, treatment, 571
eczema of, 574, 575
engorgement of, 233, 572
erysipelas of, 574
in new-born child, 239
symptoms of pregnancy in, 53
tension in, causing rise of temperature in puerperium, 220
Breech, impaction of, 474
presentation, abdominal examination in, 169, 173, 174, 175
auscultation in, 169
birth of head in, 172
causes of, 168
caput succedaneum in, 176
dangers to child, 178
diagnosis, see Abdominal and Vaginal Examination

Breech presentation, external rotation in, 172
extraction of head in, 201
frequency of, 168
heart-sounds in, 169
impacted, 474
incomplete, 163
lateral flexion of trunk in labour with, 171
management of, 199
mechanism of labour in, 171, 174
modes of, 168
moulding of head in, 176
positions of, 169
prognosis in, 178
rotation of fœtus in, see mechanism of labour in
sacro-posterior cases, 174, 175
vaginal examination in, 170, 173, 174, 175
varieties of, 163
Bregma, 92
Bright's disease, see Albuminuria
Brim of pelvis, 81
diameters of, 83
forceps at, 374
Tarnier's at, 375
Broad ligaments, change in pregnancy, 47
puerperium, 213
in labour, 100
Bromides in eclampsia, 513
Bronchitis in pregnancy, 298
Brow presentation, caput succedaneum in, 167
causes of, 165
management of, 199
mechanism of labour in, 166
moulding in, 167
prognosis of, 178
rarity of, 165
treatment of, 199
vaginal examination in, 166
Bruit, cardiac, in puerperium, 219
'placental,' 62
umbilical, 63
uterine, 61
Brunettes, pigmentation of areola in, 53, 54
Budin's intra-uterine tube, 227
Bulging of anterior wall of lower uterine segment, 454
Bulging of posterior wall of uterus, 455
Butter in milk, 218

Cæsarian section, 394
abdominal incision in, 396, 397
after death, 395
after-treatment of, 399
assistants' duty in, 398
checking hæmorrhage in, 397
cleansing peritoneum after, 398
extraction of fœtus in, 397
for atresia of vagina, 458
for cancer of cervix, 457
for pelvic contraction, 441
for vaginal stenosis, 458
incision into uterus in, 397
indications for, 395
instruments for, 395
modification of, Porro's, 401
Cæsarian section, modification of, Porro's, advantages of, 401
Cæsarian section, modification of, Porro's, instruments required, 401
Cæsarian section, modification of, Porro's, modes of operating, 401, 402
Cæsarian section, object of, 401
preparations for, 396
removal of placenta in, 398
scope of operation, 395
sterilisation during, 398
sutures in, 398
time of operating, 396
uterine rupture after, 489
Calcareous degeneration of decidua, 27
sac in ectopic gestation, 320
Calculation of age of fœtus, 66
date of pregnancy, 65
time of delivery, 65
Calculus, vesical, in labour, 460
Callipers, 416
'Canalised fibrin,' 18
Cancer of cervix in labour, 457
in pregnancy, 290
as a cause of hæmorrhage during pregnancy, 335
of uterus in pregnancy, 290
of vagina in pregnancy, 291
Canula for saline infusion, 360
Caput succedaneum, 119
after delivery, 239
in breech presentations, 176
in brow presentations, 167
in contracted pelvis, 430
at different stages of labour, 106, 119
in face presentations, 163, 165
mode of production, 108
in vertex presentations, 119
Carbolic acid, compatibles with, 183
use of, in midwifery, 184, 227
Cardiac disease in labour, 503
pregnancy, 296
sounds, fœtal, 62
in lying-in period, 219
Carneous mole, 248
Cartilage in rickets, 265
Carunculæ myrtiformes, 68
Casein in milk, 242
Caseinogen, 242
Catheter, cystitis caused by, 189, 230
in labour in first stage of, 189
second stage of, 118
method of passing, 189
post-partum, use of, 230
precautions before passing, 189
in reposition of uterus, 276
Caul, 115
Cavity of pelvis, 82, 84
Cellulitis, see Parametritis
Central placenta prævia, 341, 347
rupture of perinæum, 496
Centre of gravity of fœtus, causing certain lies, 34
Cephalhæmatoma, 581
Cephalic lie, 129
causes of, 34
frequency of, 34
version, 366, 473
Cephalotribe, 388
advantages of, 389
contrasted with craniotomy forceps, 391
description of, 388
mode of use, 389
Cervical hook, 391
myoma, 457
Cervix after delivery, 209, 211
anterior lip, management of, 190
œdema of, 115, 190
apparent shortening of, 45
artificial dilatation of, 356, 456

Cervix, atresia of, 455
blue discolouration of, 46
cancer of, in labour, 457
pregnancy, 290
catarrh of, in pregnancy, 288
changes in, in pregnancy, 44
cicatrices of, 456
difference in shape of, according to parity, 46, 68
dilation of, 104
dilatation of, 356
by dilating bags, 358
by Hegar's dilators, 356
in rigidity, 456
by tents, 356
in uncontrollable vomiting, 286
displacement of, 454, 455
ectropion of, 68
erosion of, in pregnancy, 335
eversion of lips of, after labour, 68, 211
glands, Nabothian, of, 46
hæmorrhage from lacerated, 494
hyperæmia of, after labour, 212
incision of, in cancer, 457
in cicatricial conditions, 456
involution of, 214
laceration of, 68, 494
left side, why commoner on, 68
treatment of, 494
in lying-in state, 209, 211, 214
malformation of, 456
Nabothian glands of, 46
new growths of, 456
nipping of, 428
obliteration of, in labour, 111, 112
œdema of anterior lip, 115, 190
in pelvic contraction, 428, 429
in placenta prævia, dilatation of, 347, 348, 349; rigidity of, 345
plugging of, in abortion, 311
in placenta prævia, 347
post-partum condition of, 211
in pregnancy, 44
rigidity of, 456
secretion of, in labour, 110
shortening of, apparent, 45
real, 110
softening of, in pregnancy, 46
spasm of, 188
stenosis of, 456
supra-vaginal elongation of, 456
violet discolouration of, 46
Chamberlen, forceps of, 371
Champetier de Ribes' bag, 359
in placenta prævia, 348
Change of circulation in fœtus, 235
Chest in pregnancy, 57
Child, asphyxia of, 519. See also Fœtus and New-born Child
breasts of new-born, 239
care of new-born, 240
effects of contracted pelvis on, 430
first inspiration of, 237
icterus of new-born, 238, 581
after late ligature of cord, 194, 582
injuries to, in breech presentation, 178
management at birth, 194
physiology of, 235
pulse of, 237
size of, excessive, 32
temperature of, at birth, 237
urine of, 237
Child-bed, see Puerperium
Chloral in eclampsia, 513
Chloroform, deaths from, 205
during labour, 205
during operations, 206
in eclampsia, 512
effect on fœtus, 194, 206
effect on pains, 206
excreted in urine of new-born child, 206
mode of administration, 205
in precipitate labour, 407
in rigidity of cervix, 206
Chlorosis in pregnancy, 282
Choice of leg in version, 369
Cholera in pregnancy, 302
Cholesterin in lochia, 217
Chorea in pregnancy, 280
causes of, 281
course of, 281
frequency of, 280
hyperpyrexia in, 281
mania in, 281
symptoms of, 281
treatment of, 282
during puerperium, 282
treatment of, 282
Chorion, degeneration of, hydatidiform, 252
myxomatous, 252
development of, 5, 8
in moles, carneous, 248, 250
vesicular, 252
in multiple pregnancy, 73
myxoma of, diffuse, 256
pathology of, 252
retention of, 114, 125
rupture of, without amnion, 114
separation from amnion, 114, 125
villi of, 5
in carneous mole, 248, 250
Cicatrices of genital canal, 455, 458, 459
rupture of uterus through, 489
Circular rupture of portio vaginalis, 494
Circulation, changes in, at birth, 235
disorders of, during pregnancy, 56, 282
effect of pregnancy on, 56
in fœtus, 235
in new-born child, 235
in placenta, 12, 15
Circumference of fœtal head, 95
Cleanliness, aseptic, 226
Clitoris, lacerations of, in labour, 501
Clothing of new-born child, 240
during pregnancy, 76
Clots in abortion, examination of, 309
Coccygeus muscle, 87
Coccyx, 87
Cœlom, 8
Coiling of cord round fœtus, 192, 478
Coitus, date of, in date of pregnancy, 65
during pregnancy, 77
effect of, on hymen, 67
Colic, uterine, 109
Collapse after placenta prævia, 350
due to accidental hæmorrhage, 337
in inversion of uterus, 487
due to rupture of uterus, 491
Colles' law, 302
Colostrum corpuscles, 53
stage, breast-acini in, 53
Coma in eclampsia, 510
Combined version, 367
Commencement of labour, diagnosis of, 110
Compound presentations, 476
Compression of aorta for post-partum hæmorrhage, 485
Compression of uterus for post-partum hæmorrhage, 484

Concealed accidental hæmorrhage, 337
Conception, false, see Mole
time of, 65
Condensed milk in infant feeding, 244
Confinement, see Labour
Conformation of woman in pelvic contraction, 415
'Congenital dislocation of hips,' pelvis of, 425
Conjugate diameter of pelvis :
anatomical, 83
conjugata vera, 83
diagonal, 417, 418
external, 417
in flat pelvis, 425
in generally contracted pelvis, 426
in generally contracted flat pelvis, 426
measurement of, 419
measurement of, through abdominal wall, 420
measurement of, direct, 419
measurement of, Johnson's method, 419
obstetrical, 83
Constipation in pregnancy, 57
puerperium, 222
causing rise of temperature, 220, 569
retroversion of gravid uterus, 275
Contraction of abdominal muscles in labour, 126
hour-glass, 479
pelvic, 415
abortion in, 440
after-coming head in, 443
anteflexion and anteversion of uterus with, 271
appearance of patient suggesting, 415
bag of membranes in, 428
Cæsarian section in, 441, 442
causing breech presentations, 169
causing face presentations, 155
cephalotripsy in, 442
cervix in, 429
course of labour with, 428
craniotomy in, 440, 442
dangers arising from, 427
diagnosis of, during labour, 437
displacement of uterus in, 427
effect on cervix, 429
child, 430
labour, 428
pregnancy, 427
puerperium, 432
uterus in labour, see Prolonged Labour
vagina, 429
face presentations with, 155
face presentations, management of, with, 199
figure-of-eight, 427
fistulæ caused by, 432
forceps in, 442
frequency of, 415
Contraction, pelvic, induction in, 439
injury to skull during labour with, 431
labour in, 428
management of, in, 441
mechanism of labour in, 432
(and see under each variety of deformity)
oblique, 443
pains in, 428
pendulous belly with, 271, 427
perforation in, 440, 442
post-partum hæmorrhage with, 431
presentation in, 427
pressure-marks on skull after labour with, 431
rare forms of, 443
relative, 415
reniform pelvis, 426
rupture of uterus in, 489
symphysiotomy in, 443
transverse, 447
treatment of common forms of, 438
varieties of, 424
version in, 442
Contractions, uterine, abnormal, 411
characters of, 96
with contracted pelvis, 428
definition of, 97
duration of, 96
during labour, 96
action on uterus and contents, 102
in first stage, 111
during pregnancy, 38
uses of, 38
Contractions, uterine, effect on circulation in fœtus, 106
Contractions, uterine, effect on circulation in placenta, 106
Contractions, uterine, effect on circulation in uterus, 96, 106
Contractions, uterine, effect on eclamptic fits, fœtal pulse, 106
maternal pulse, 106
nervous system of mother, 107
respiration, 107
shape of abdomen, 111
shape of fœtus, 103
shape of uterus, 111
skin, 107
uterine bruit, 106
intermission of, 96
irregular during labour, 414
irregular during pregnancy, 70
pain of, 97
causes, 97
post-partum, 208. Also see After-pains
rhythm of, 96
Contractions, vaginal, 100
Convulsions, eclamptic, 510
puerperal, 510
Cord, umbilical, anomalies of, 27, 262
arteries of, 21
atheroma of, 262
development of, 22

Cord, umbilical, arteries of, dilatations in, 22
walls of, 22
capillaries, ring of, at base of, 239
care of, after exit of head, 192
care of, in infant, 240
circulation in, 21
coiling of, round fœtus, 192, 478
cysts of, 28
development of, 21
diagnosis of prolapse of, 514
division of, before delivery, 478
early and late ligature of, 193, 238
falling off of stump of, 239
formation of, 21
hæmorrhage from, 584
in breech presentation, 200
insertion of, central, 27
lateral, 27
marginal, 27
velamentous, 27
intestine in base of, 22, 30
knots of, 28, 262
laceration of, 517
late ligature of, 193, 194
gain in weight after, 194
jaundice after, 194, 582
length of, 21
ligation of, 193, 194
best time for, 193
loop of, round neck, 192
management of, in breech presentations, 200
marginal insertion of, 27
modes of insertion, 27
nodosities of, 28, 262
over-torsion of, 262
pathology of, 262
presentation of, 514
in face presentations, 199
pressure on, 178, 200
prolapse of, 514
in face presentations, 199
in podalic lies, 179
version for, 516
pulsation in, cessation of, 193
reposition of, 516
round neck, 119, 192
rupture of, 478, 517
in precipitate labour, 478, 517
treatment of, 518
separation of stump of, 239
sheath of, 21
short, 478
treatment of, 478
structure of, 21
torsion of, 21, 30
excessive, 262
traction on, in labour, causing inversion, 487
tying the, 193, 194
vein of, 21
velamentous insertion of, 27
vessels of, 21
diseases of, 262
Cordate uterus, 293
Coronal suture, 92
Coronary vein of placenta, 17
Corpus luteum, 2
of pregnancy, of menstruation, 4
constancy of occurrence, 4
Corrosive sublimate, compatibles with, 183
use of, in midwifery, 184
Cotyledons of placenta, 13
Cow's milk, composition of, 242
preparation of, 242
Cracked nipples, see Nipples
Cranial bones, injuries to, during labour, 430
relative displacement of, during labour, 92
Cranioclasm, 390
Cranioclast, 390
Craniotomy, see also Perforation, 386
with after-coming head, 392
in cancer of cervix, 457
conditions requiring, 387
extraction of child after, 388, 391
in face presentations, 199
in flat pelvis, 442
-forceps, see Craniotomy Forceps
mode of operation, 387
mortality after, 392
preliminary version in, 392
in rupture of uterus, 492
in small round pelvis, 442
version after, 391
Craniotomy forceps, 389
contrasted with cephalotribe, 391
mode of use as cranioclast, 390
as tractor, 389
patterns of, 390
Cranium, alterations in shape due to labour, 92
fontanelles of, 92
fracture of, 430
injury to, during labour, 430
ossification of, advanced, 440
shape of, in breech presentations, 176
brow presentations, 167
face presentations, 162
Cream in infant feeding, 243
Crédé's method of expressing placenta, 195
treating eyes, 240
Crests, iliac, distance apart, 416
Cretinism, sporadic, 266
Crotchet, use of, after perforation, 391
Croton oil in eclampsia, 513
'Crowning,' period of, 119
Cry, fœtal, in utero, 502
Curette in puerperal fevers, 531
Curvature, spinal, causing pelvic deformity, 443
Curves of forceps, 372
Cutaneous diseases in syphilis of fœtus, 585
disorders during pregnancy, 56, 282
Cyst, mammary, 574
ovarian, in labour, 460
in pregnancy, 292
treatment of during pregnancy, 291
during labour, 461
placental, 27
Cystic mole, 252
tumours, diagnosis of, from pregnancy, 292
Cystitis after delivery, 566
due to incarceration of gravid uterus, 275
Cystocele causing dystocia, 457
diagnosis of, 457

Dangerous zone, 342
Date of delivery, calculation, 65
by size of fœtus, 66
uterus, 66
Death, apparent, of new-born child, 519
of fœtus, intra-uterine, 269
causes of, 269
diagnosis of, 71, 270

Death of fœtus, intra-uterine, effect on attitude, 155
effect on liquor amnii, 270
effect on mammary glands, 270
effect on presentation, 155, 467
effect on uncontrollable vomiting, 285
results of, 270
signs of, 270
of mother during child-birth, 502
puerperium, 502
sudden, 502
delivery of child in, 398, 503
of one of twins, 74
Decapitation, 393
delivery after, 393
instruments for, 393
with locked twins, 393
mode of, 393
in transverse lies, 393, 473
Decidua, affections of, 246
ampullary layer of, 7, 16, 247
apoplexy of, 248
calcification of, 27
cells of, 6
development of, 4, 6
imperfect, 252
discharge of, in ectopic pregnancy, 324, 325
diseases of, 246
causing adhesions of placenta, 479
in ectopic pregnancy, 323
enclosure of ovum by, 5
endometritis of, 246, 247
fluid between reflexa and vera causing second bag of waters, 114
glands of, 6
hæmorrhage into, 248
causation of, 248
inflammation of, 246
in multiple pregnancy, 73
pathology of, 246
reflexa, 6
atrophy of, 7
serotina, 6
vera, 6
Decidual cast, 324
processes, 13
'Deciduoma malignum,' 577
Decomposition of fœtus, 270
Deformities, see Fœtus and Pelvis
Degeneration of chorion, hydatidiform, 252
of fœtus, calcareous, 320
of uterine tissue, causing rupture, 489
Delayed delivery, see Delivery
Delivery of arms in cephalic lie, 139
collapse during, 502
in contracted pelvis, 422
corpore conduplicato, 471
date of, calculation of, 65
by size of fœtus, 66
by size of uterus, 66
diagnosis of recent, 223
first stage, see Labour
of hips in cephalic lie, 139
obstructed, see Obstructed Labour
placental stage, see Labour
post-mortem signs of, 224
Delivery, precipitate, see Precipitate Labour
premature, 303
induction of, 362
protracted, 407
and septicæmia, 408
recent, signs of, 223
retraction of uterus after, 208
of shoulders in head presentations, 139
signs of recent, 223
by spontaneous evolution, 470
version, 469
in transverse lies, 468, 469, 470, 471
Dementia, 560
Depressed nipples, 569
Dermoids, suppuration of, 461
Desquamation in new-born child, 238
Detachment of placenta, 121
Detrusion of placenta, 121
Development of membranes, 7
ovum, 7
pelvis, 421
body-weight in, 421, 422, 423
sacrum, 421
Dextro-rotation of uterus, 41
Diabetes with hydramnios, 257
in pregnancy, 298
during puerperium, 298
Diabetes insipidus, 299
Diagnosis of commencement of labour, 11
of contracted pelvis, 415
of death of fœtus, 71, 270
of delivery, 223
of time of, 65
between first and subsequent pregnancies, 67
of lies and positions, 149
between tonic contraction and inertia 411, 412
differential, of pregnancy, 69
of parity, 67
of period of pregnancy, 65
of pregnancy, 58
differential, 69
of puerperal state, 223
of sex before birth, 62
Diagonal conjugate, 417, 418
method of measurement, 418
Diameter of Baudelocque, 85, 417
of fœtal head, 93
of pelvis, contracted, 415. See the various forms
normal, 83
Diaphoretics in albuminuria, 508
in eclampsia, 512
Diaphragm, action of, during labour, 100
effect of uterus on, during pregnancy, 57
Diarrhœa in septicæmia, 530
Diastema rectorum, 216
with pendulous belly, 271
Diet during puerperium, 230
of new-born child, 240
Difficult labour, see Pathology of Labour
Digestion, disorders of, in pregnancy, 57, 284 286. 298
in new-born child, 237
Dilatation of cervix, 356
artificial, 356
in accidental hæmorrhage, 339
for carneous mole, 252
to induce labour, 356, 365
in placenta prævia, 348

Dilatation of cervix, artificial, in uncontrollable vomiting, 286
of pelvis in osteomalacia, 451
Dilation of cervix, 104, 112
delay during, 272, 408, 411, 456
duration of period of, 127, 407
during labour, 104, 112
during pregnancy, 110
inertia during, 411
slow, see delay during
Dilators, see Tents, Barnes's Bags, Champetier de Ribes
Dilution of cow's milk, 243
Dinting of fœtal head, 431
Diphtheria and puerperal septicæmia, 548
Diphtheritic membrane in septicæmia, 548
'Dipping' in abdominal examination, 153
Discharge of fluid during pregnancy, 247
lochial, see Lochia
purulent vaginal, during labour, 188
Discus proligerus, 2
Disinfectants in midwifery, 183
Disinfection of, genital canal, 188
of hands, 184
of instruments, 352
of vagina during labour, 188
of vulva before catheterism, 189
during labour, 188
Dislocation, congenital, so-called, of hips, 425
of lumbar vertebræ, causing spondylolisthesis, 452
Displacements, dorsal, of arm, 475
of os uteri, 454, 455
of uterus in contracted pelvis, 427
with pendulous belly, 271
causing protracted labour, 414
causing rupture of uterus, 490
in ectopic gestation, 325
post-partum, 576. See Anteversion, Prolapse, Retroversion
of vagina, 279, 457
Distension of bladder of fœtus, causing dystocia, 465
of uterus, causing after-pains, 231
inertia, 411
Distortion of pelvis, oblique, 443
Disuse of leg, causing pelvic deformity, 445
Diuretics in albuminuria, 508
Dolichocephalic head in face presentations, 156
Dorsal displacement of arm, 475
Dorso-anterior positions of breech, 169, 173
in transverse lies, 467
Double monsters, 465
uterus, 294, 459
in superfœtation, 76
in twin pregnancy, 75
vagina, 294, 460
Douche, administration of, 226
after labour, 226
to induce premature labour, 363
routine in lying-in cases, 185
-tin, 185
uterine, 227
hot uterine, 482
uterine, in puerperal septicæmia, 531
vaginal, after labour, 226
before labour, in case of vaginal discharges, 188, and see Injections
in puerperal septicæmia, 530
Douglas, spontaneous evolution of, 470
Drainage, after rupture of uterus, 400, 493
Dress during pregnancy, 76
Dropsy, see also Œdema
of amnion, 257
of fœtus, 268, 465
albuminuric, of pregnant woman, 507
Drugs in the milk, 218
Duct, umbilical, 9, 10
Ducts, milk, infection through, 572
Ductus arteriosus, 235
venosus, 235
patency of, causing jaundice, 582
Duration of labour, 127, 406
abnormality in, 406
of pregnancy, 65
Dwarf pelvis, 425
Dyspepsia, 286
Dyspnœa, fœtal, see Asphyxia
in pulmonary embolism, 551
thrombosis, 550
Dystocia, see Obstructed Labour
Dysuria after delivery, 222
due to retroversion of gravid uterus, 275

Ecchymoses in fœtus, 580
stillborn, 108
Eclampsia, 509
albuminuria in, 508, 509
blood letting in, 513
cause of, 509
chloroform in, 512
convulsions and pains in, 510
course of, 510
diagnosis of, 511
diaphoretics in, 512
effect of, on uterus, 511
frequency of fits in, 510
induction of labour for, 512
morphia in, 513
mortality in, 512
pathology of, 509
premonitory symptoms of, 510
prognosis of, 512
prophylaxis of, 508
purgation in, 513
sequelæ of, 512
status epilepticus in, 510, 512, 513
symptoms of, 510
terminations of, 511
treatment of, 512
urine during, 509, 511
venesection in, 513
wet-packing in, 512
Ectopia viscerum, 264, 585
Ectopic gestation, 313
'abdominal,' 318
abdominal section in, 331
ampullar, 315
anatomy of, 316
cast of uterus in, 323
causes of, 313
coexisting with intra-uterine, 313
death of fœtus or embryo in, 320, 326
decidua in, 316, 323
definition of, 313
diagnosis of, 327
effect on uterus, 323
endometrium in, 323
fistula in, 326
operations on, 334
fœtal sac in, 317, 332

Ectopic gestation, fœtal sac in, calcification of, 320
fœtus, death of, in, 320
mummification of, 320
frequency of, 313
hæmatocele in, 314, 318
hæmorrhage in, 325
into ovum, 322
infundibular, 322
in hernial sac, 320
infundibular, 315
interstitial, 315, 318, 322
lithopædion in, 320
membranes of, 320
mole in, tubal, 322
mummification in, 320
ovary in, 316
peritoneum of pelvis in, 320
placenta in, 317, 333
prognosis, 329
rupture of sac of, 320
'secondary,' 315, 320
signs of, 325
sub-peritoneo-abdominal, 315, 320
sub-peritoneo-pelvic, 315, 319
suppuration after, 320
symptoms of, 324
terminations of, 315, 318, 319
treatment of, 330
tubal, 315
abortion in, 322
rupture of, 317
varieties of, 315
uterus in, 323
vaginal operation for, 334
Eczema of breasts, 574
in galactorrhœa, 575
Elastic bags, 349, 358
Elasticity of uterus, 100
Elbow, diagnosis from heel, 472
Electricity in ectopic gestation, 330
in galactorrhœa, 575
in post-partum hæmorrhage, 482
Elongation of fœtus in labour, 103
hypertrophic, of cervix, 456
Elytrotomy in ectopic gestation, 334
Embolism in puerperal septicæmia, 540, 552
of pulmonary artery, 551
causing sudden death, 551
symptoms of, 551
treatment of, 552
of systemic arteries, 552
Embryo at different months, 29
in carneous mole, 249
development of, 29
Embryonic area, 7
Embryotomy, 386
indications for, 387, 393, 394
in transverse lies, 393, 473
Emotion, causing rise of temperature in puerperium, 220, 562
Emphysema of face and neck, 502
subperitoneal, 555
of thorax, 502
Encephalocele, 264
Enchondromata obstructing labour, 454
Endocarditis in puerperium, 540, 552
Endometritis after delivery, 534
decidualis catarrhalis, 247
causing abortion, 261, 304
causing adherent placenta, 479
polyposa, 246
morbid anatomy of, 247
tuberosa, 246
Endometrium after labour, 212
Endometrium in puerperium, 215
Enema at beginning of labour, 187
nutrient, in uncontrollable vomiting, 285
Engagement of head, 130
Engorgement of breasts, 233
Enterica during pregnancy, 300
in puerperium, 548
Entrance of air, see Air, entrance of,
Epiblast, 7
Epidemics of puerperal septicæmia, 182
Epilepsy, diagnosis from eclampsia, 511
during pregnancy, 296
Epiphyses, changes in, in cretinism, 267
in rickets, 266
in syphilis, 266
Episiotomy, 192
Epithelioma of cervix in labour, 45
in pregnancy, 290
causing hæmorrhage, 335
Equitation of cranial bones, 93
Ergot in abortion, 310, 313
in accidental hæmorrhage, 339
for after-pains, 231
causing rupture of uterus, 489
contraindications to, 413
in galactorrhœa, 575
imperfect retraction, 576
induction of labour, 363
inertia, 412
placenta prævia, 350
post-partum hæmorrhage, 484
puerperal period, 231
uterine inertia, 412
Erosion of cervix in pregnancy, 335
nipple, 570
Erratic vessel in placenta, 24
Erysipelas of breasts, 574
in pregnancy, 302
puerperium, 542
coccus of, 542, 543
Erythemata in puerperium, 568
septicæmia, 528
Estimation of age of fœtus, 65, 66
conjugate, 418, 419, 420
period of pregnancy, 65, 66
time of delivery, 65, 66
Ether in thrombosis or embolism of pulmonary artery, 552
Ether in obstetrical cases, 205
Eustachian valve, 235
Eventration, 394
Evisceration, 393
Evolution, spontaneous, 470
Examination, abdominal, 150
bimanual, 63, 72
of breasts, 53, 72
of placenta and membranes, 196
of perinæum after labour, 196
systematic of cases, 72
vaginal after labour, 196
during labour, 134, 186
in pregnancy, 63
of vaginal orifice after labour, 196
Exanthemata in pregnancy, 299
puerperium, 544
Excessive size of child, 32
quantity of liquor amnii, 257
milk, 574
Excitation of respiration in stillbirth, 520
Excitement during lying-in, 220, 562
Excoriation of nipple, 570
Exercise during pregnancy, 76
Exhaustion of uterus, 412
Exomphalos, 265
Exophthalmos in pregnancy, 56, 297

Exostoses of pelvis, 454
Expansion, area of, in placenta prævia, 342
hour-glass, 479
Expression of cord, 514
fœtus, 193, 200
head after decapitation, 393
placenta, 195
Expulsion, corpore conduplicato, 471
of membranes, 125
of placenta, 125
spontaneous, 471
Expulsive forces, action of, 95
abnormalities of, 406, 410
weakness of, 411
Extension of fœtus in face presentation, 153
of head in flat pelvis, 435
in normal labour, 137
in occipito-posterior presentation, 145
External conjugate, 85. 417
restitution, 138
rotation, 138
version, 366
Extraction after perforation, 388
of arms in breech presentation, 200
of head in breech presentation, 201
in Cæsarian section, 397
in death of mother, 395
by forceps, 371
of placenta, 479, 480, 485
Extra-peritoneal pregnancy, see Ectopic Gestation
Extra-uterine pregnancy, see Ectopic Gestation
Extroversion of viscera, 585
Eye affections of new-born child, 580
during pregnancy, with albuminuria, 507, 509

FACE, emphysema of, during labour, 502
presentations, abdominal examination in, 157, 160, 161
ætiology, 154
caput succedaneum in, 163
compared with vertex presentations, 156
configuration of head in, 163
in contracted pelvis, 155
craniotomy in, persistent mento-posterior cases, 164
with dead children, 155
diagnosis of, 157, 160, 161
duration of labour in, 157
extension in, 153
external rotation in, 160
flexion of, head at outlet in, 160
frequency of, 154
goitre in, 156
heart-sounds in, 152, 157, 160, 161
management of, 198
mechanism of, 156, 157, 160, 161, 162
mechanism of, contrasted with that of vertex presentations, 162
mento-posterior positions, unreduced, 163
mode of production of, 154
moulding of head in, 157, 162
positions of, 157
prognosis of, 178
Face, presentations, proportion of left and right dorsal positions in, 155
rotation of fœtus in, 157
head in, 158
subconjunctival hæmorrhage in, 163
treatment of, by Schatz's method, 198
vaginal examination in, 157
Facial nerve, paralysis of, 579
Fæces, incontinence of, after perinæal rupture, 498
Fæces of new-born child, 238
Fallopian tube after labour, 212
ligature of, in Cæsarian section, 398
pregnancy in, see Ectopic Gestation
in puerperal septicæmia, 534
False conception, see Mole
False corpus luteum, 2
labour, 71
pains, 109, 186
promontory, 418
curve of, 432
Faradism, see Electricity
Fascia of pelvis, 89
injury to, 495
Fat, deposit of, during pregnancy, 57
proportion of, in milk, 218
Father, syphilis in, 268
Fatty degeneration of placenta, 260
uterine muscle in involution, 214
Fecundation of ovum, 2
Feeding, artificial, of infants, 242
bottle, 244
cleansing of, 244
frequency of administration, 244
Femur, 'dislocation' of, causing pelvic deformity, 425
Fergusson's speculum, 354
Ferments, digestive, in new-born child, 238
Ferri perchloridi liquor, 483
Fever, enteric, in pregnancy, 300
malarial, in pregnancy, 301
relapsing, in pregnancy, 301
scarlet, 544
septic, 526
smallpox in pregnancy, 300
typhoid, in pregnancy, 300
typhus, in pregnancy, 301. See also Puerperal Fevers
Fibrinous polypus after abortion, 308
Fibroid, uterine, causing inversion, 455
of cervix, 457
changes in, during pregnancy, 288
complicating pregnancy, 288
diagnosis of, from pregnancy, 69
ectopic gestation, 328
extirpation of, 455
hæmorrhage from, during pregnancy, 288, 336
labour with, 455
necessitating abortion, 290
obstructing labour, 455
'Fibroma' of placenta, 261
Figure-of-eight pelvis, 428
Fillet in extraction of head, 386
Fimbriæ of tube, 2
Finger in extraction of breech, 474
Fissure of nipple, 570
Fissured pelvis, see Split Pelvis, 425
Fistula, after ectopic gestation, 326, 334
in contracted pelvis 432
lacteal, 572
rectal, 429

Fistula, vaginal, 429
vesico-vaginal, 429, 567
Fit, eclamptic, 510
Flat pelvis, 424
causation of, 424
description of, 425
diagnosis of, 425
malpresentations in, 427
measurements of, 425
mechanism of labour with, 432, 436
Nägele obliquity in, 433
varieties of 425
Flat generally contracted pelvis, mechanism of labour in, 436
Flat split pelvis, 425
with congenital dislocation of hips, 425
Flattening of fœtal skull, 140
of one of twins, 74
Flexion of head during labour, 132
causes of, 132
during pregnancy, lateral, 137
insufficient in occipito-posterior positions, 145
of trunk, lateral, in breech presentations, 171
in head presentations, 139
of uterus in pregnancy, 39
puerperium, 209, 213, 576
Floor of pelvis, 86
effect on head, 116
Fluid, amnio-chorionic, 114
amnionic, 19
Fœtal axis pressure, 103
causing flexion of head, 133
Fœtation, ectopic, see Ectopic Gestation
Fœtus, abdominal enlargement of, obstructing delivery, 465
abnormal attitudes of, 474
abnormalities of, obstructing delivery, 463
acardiacus, 74
adhesion of amnion to, 259
of, to placenta, 259
anasarca of, 465
anatomy of, 90
anencephalus, 263
ascites of, 265, 465
asphyxia of, 519
aspiration of blood by, 193
at different months of pregnancy, 29, 66
attitude of, in utero, 32
ballottement of, 64
bladder of, distension of, 265
bones of, diseases of, 265
fractures of, 267
causes of death of, 269
centre of gravity of, 34
affecting lie, 34
changes in dead, 270
characters of, mature, 30
at earlier periods, 29
circulation in, 235
coiling of cord round, 192, 478
cranium of, 91
cretinism, sporadic, of, 266
cry of, before delivery, 502
death of, intra-uterine, 269
treatment, 271
decapitation of, 393
decomposition of, 270
causing physometra, 502
degeneration, fatty, of, 270
diagnosis of dead, 270
of living, 62
diameters of head of, 93
trunk of, 91
Fœtus, diseases of, 263
dropsy of, 268, 465
earliest movements of, 59
ectopia viscerum in, 264
effect of chloroform on, 206
effect of pains on, 106, 107
encephalocele of, 264
epiphysitis of, 265
estimation of age of, 66
evisceration of, 394
excessive size of, 462
expression of head of, 200, 201
expulsion of, see Second Stage of Labour
extra-uterine, 330
flexion of, 35, 90, 129
fontanelles of, 92
fractures in, 267
funis of, see Cord, Umbilical
glabella of, 92
goitre of, 267
hæmorrhage into, during birth, 108, 580
head of, at term, 91, 93
diminution of volume of, during labour, 93
measurement of, immediately after labour, 420
heart, sounds of, 62
in face presentations, 157, 160, 161
in hydatidiform mole, 255
in pregnancy, 62
hernia, umbilical, of, 265
hydrocephalus of, 263
obstructing labour, 263, 463
hydrothorax of, 265, 465
intra-uterine diseases of, 263
death of, 269
lanugo of, 31
large size of, obstructing labour, 462
length of, at different periods of pregnancy, 66
at term, 30
lie of, in uterus, cause of, 34
definition of, 32
varieties of, 32
maceration of, 270
malformations of, 263, 465
malpresentations of, in contracted pelvis, 427
malpresentations of, in contracted pelvis, causes, 428
maturity, signs of, 30
measurements of, 91
meconium of, 238
membranes of, see Amnion, Chorion, Decidua
membranes of, in twin pregnancy, 73
meningocele of, 264
monstrosities affecting labour, 465
movements during pregnancy, 61
when first felt, 59
mummification of, in ectopic gestation, 320
nutrition of, 22
œdema of, 268, 465
ovarian cysts in, 265
ovoids of, 90
papyraceus, 74
pathology of, 263
perforation of, see Perforation
pleural effusion in, 465
position of, definition of, 32
in utero, 34
cause of, 34
presentations of, definition of, 33
putrefaction of, 270
retention of, in utero, 269

Fœtus, retroflexion of, 264
rickets in, 265
separation from mother, 193
septic infection of, 584
sex, date of distinction of, 30
size of, at different months, 29
skull of, 91
base of, 91
diameters of, 93
vault of, 91
plasticity of, 92
small-pox in, 301
spina bifida of, 264
sporadic cretinism of, 266
sutures of, 92
syphilis in, 265, 268
temperature of, at birth, 237
trunk of, 91
tumours of, 465
umbilical hernia of, 265
urine of new-born, 237
vernix caseosa of, 31
weight of, at term, 30
Fœtuses, multiple, 72
causing inertia, 204, 411
Follicle, Graafian, 1
of areola, 53
Fontanelle, anterior, 92
position of, in labour, in occipito-posterior positions, 145
lateral, 92
perforation through, 388
posterior, 92
temporal, 92
Food for new-born children, 242
manufactured, 244
Foot, diagnosis of, 472
prolapse of, 476
selection of, in version, 369
Footling presentation, 168
mechanism of labour in, 176
Foramen ovale, 235
closure at birth, 237
valve of, 235
Foramen, obturator, see Pelvis, p. 81
Forceps, 371
action of, 383
application of, 377
to after-coming head, 202
at brim, 378
at outlet, 385
routine of, 377
Assalini's, 374
axis-traction, 374
Barnes's, 374
blades of, introduction of, 378
relation to head, 385
pelvis, 385
causing facial paralysis, 579
Chamberlen's, 372
conditions requiring, 376
contraindications to, 377
in contracted pelvis, 442, 448
craniotomy, see Craniotomy Forceps
curves of, 372
description of, 371
etymology of term, 371
extraction of after-coming head by, 202
force, amount of, required, 384
Galabin's axis-traction, 375
history of, 372
indications for, 376
introduction of blades, 378
lever action of, 384
lock of, 372
locking of, 381
Forceps, long, 372
curved, 373
oscillation of, 384
in placenta prævia, 347
preparations for, 377
in protracted labour, 412. See also Contraction of Pelvis
rotation in, 385
short, application of, 386
Simpson's, 372
Tarnier's, 374
traction, direction of, 374, 381
in vaginal thrombus, see Appendix A
Forces, expulsive, 95
of abdominal muscles, 100
auxiliary, 100
magnitude of, 101
of round ligaments, 100
of uterus, 96
of vagina, 100
Fore-waters, action of, 105
definition of, 106
isolation of, 106
Form-restitution force, 103
causing flexion of head, 133
Fossa navicularis, injuries to, 191
Fourchette, rupture of, 191
Fracture, intra-uterine, 267
of cranial bones in contracted pelvis, 431
of pelvis, causing pelvic deformities, 454
Fundus uteri in cordate uterus, 293
height of, during pregnancy, 39, 66
puerperium, 209, 213
insertion of placenta on, 15
inversion of, 486
lateral displacement, 208
Funic souffle, 63
Funis, see Cord, Umbilical

Galactocele, 574
Galactogogues, futility of, 575
Galactorrhœa, 574
Galvanism in ectopic gestation, 330
Gangrene of fibroid, 455
of inverted uterus, 488
of mucous membrane of bladder in retroversion of gravid uterus, 275
Gases in uterus, 502
General intra-uterine pressure, 102
paralysis of the insane in pregnancy, 558
Generally contracted flat pelvis, 426
after-coming head in, 437
causation of, 426
description of, 426
diagnosis of, 427
effect of, on labour, 428
lying-in, 432
pregnancy, 427
mechanism of labour in, 436
Generally contracted pelvis, 425
after-coming head in, 437
causes, 425
characters of, 425
diagnosis of, 426
measurements of, 426
mechanism of labour in, 436
dwarf variety, 425

Generally contracted pelvis, infantile variety, 425
Genital canal, atresia of, 455, 458
description of, 79
disinfection of, 184, 185
lacerations of, 489
in septicæmia, 526
rupture of, 489
Genu-pectoral position in replacing presenting cord, 516
in replacing prolapsed cord, 516
in retroversion of gravid uterus, 277
Germinal area, see Embryonic Area, 7
spot, 2
vesicle, 2
Germs, infectious, 525, 526
putrefactive, 525
in puerperal septicæmia, 525
saprophytic, 525
septic, 525
Gestation, see Pregnancy
Gingivitis in pregnancy, 57
Girdle of contact, see Mechanism of Labour, 132
Glabella, 92
Glands, cervical, 46
decidual, 6
mammary, see Breasts
Nabothian, 46
salivary, during pregnancy, 57
sebaceous, of skin in pregnancy, 58
sweat-, in axillary lumps, 58
uterine, 6
Glass tubes for irrigation, 227
Globules, milk-, 218
Glottis, action of, in labour, 117
Glycerine in induction of labour, 363
Glycosuria, 227. See also Diabetes
Goitre causing face presentations, 156
fœtal, 267
in pregnancy, 56
in sporadic cretinism, 266
Gonococcus, 541
Gonorrhœa in puerperium, 541
Graafian follicle, bursting of, 2
description, 2
maturation of, 1
number of, 1
Gravid uterus, anteflexion of, 39, 271
anteversion of, 39, 271
changes in cervix of, 44
hernia of, 280
incarceration of, 273
lymphatics of, 44
muscular fibres of, 41
nerves of, 44
prolapse of, 278
retroflexion of, 278
retroversion of, 273
treatment of, 276
vessels of, 42
Gravity, action of, in labour, 105
effect of, on lie and position, 34
Grooves on fœtal head, 431
separating body of uterus from lower segment, 98, 118, 410
Growth, changes in shape of pelvis during, 421
Gummata, syphilitic, in fœtus, 268

Habitual abortion, 304
Hæmatemesis in new-born child from cracked nipples, 233
Hæmatocele, 320
Hæmatoma of pelvis, 318
of placenta, 261
in placenta prævia, 343
Hæmatoma of sterno-mastoid, 581
sub-placental 122
due to tubal pregnancy, 318
of vagina and vulva, see Thrombus Vaginæ
Hæmatometra, diagnosis from pregnancy, 70
Hæmophilia neonatorum, 581
Hæmorrhage due to abortion, 305
accidental, 336, 507
'concealed,' 337
diagnosis of, 338
symptoms of, 337
treatment of, 339
after labour, see Hæmorrhage, Post-partum
due to albuminuria, 507
before delivery, 336
cerebral, with paralysis, 507
cervical, 494
into decidua, 248, 507
due to detachment of placenta, 336, 341
in ectopic gestation, 317, 324
during expulsion of placenta, 123
in fœtus, 108
intra-cranial, 108
sub-periosteal, 108, 581
hot irrigations for, 482
due to hydramnios, 258
due to inversion of uterus, 487
from lacera ions of cervix, 494
in molar pregnancy, carneous, 251
vesicular, 255
from navel in new-born child, 108, 580
into placenta, 261, 343
in placenta prævia, 341
from placental site, see Accidental Hæmorrhage and Post-partum Hæmorrhage
from polypus, 335
during pregnancy, 335
causes, 335, 507
post-partum, 480, 507
secondary, 576
prophylaxis, 186
treatment, 481
purpuric, 337
due to retroflexion of uterus, 576
due to rupture of uterus, 491
from ruptured cord, 517
secondary puerperal, 576
into sterno-mastoid in child, 581
subconjunctival in face presentations, 163
syncope after, 350, 485
transfusion in, 350, 360, 486
from umbilicus, 517, 584
unavoidable, 341
from vagina in new-born children, 239
from varicose veins, 283, 335
from vulva, 283, 495
Hand, descent of, with head, 476
feeding by, 242
introduction of, into uterus for post-partum hæmorrhage, 482
for removal of placenta, 479, 480
selection of, in version, 369
Hands, cleanliness of, 184
Head, fœtal, aftercoming, 172
application of forceps to, 202
in flat pelvis, 435

Head, fœtal, aftercoming, management of, 201
perforation of, 392
alteration of shape during labour, 140, 144, 162
anatomy of, 91
articulation of, with spine, 78, 133
asymmetry of, after labour, 144
attitude of, 129
at term, 91
in breech presentations, 172
caput succedaneum of, 108
descent of, see Labour
diagnosis of, from breech, 150, see Special Mechanisms
diameters of, 91
dolichocephalic, 156
effects of contracted pelvis on, 430
engagement of, 130
entrance of into pelvis, 130, 131
extension of, 137
external rotation of, 138
extraction of aftercoming 201
flexion of, during labour, 132
lateral, 137
insufficient, 144
fontanelles of, 92
with hand, 476
influence of age of mother on, 440
sex on, 440
internal rotation of, 135
management during passage over perinæum, 191
measurements of, 93
after labour, 420
moulding of, 140, 144, 162
disappearance after delivery, 239
movements of, during delivery, see Several Mechanisms
horizontal, in flat pelvis, 434
in occipito-anterior, 132
in occipito-posterior, unreduced, 144
summary of, 140
ossification of, 440
passage of brim by, in flat pelvis, 435
perforation of, 387
planes of, causing flexion, 132
position of, definition, 32
presentation of, 33, 129
rotation of, external, 138
internal, 135
size of, see Measurements of
sutures of, 92
transverse position in flat pelvis, 433
Headache in albuminuria, 507
Hearing in new-born child, 239
Heart, changes in, during pregnancy, 56
puerperium, 219
disease, congenital, 581
during labour, 503
during pregnancy, 296
- sounds, fœtal, 62
in diagnosis of presentations and positions, 151, 152
effect of pains on, 106
frequency of, 62
in diagnosis of sex, 62
in hydramnios, 258
a proof of living fœtus, 62, 270
maternal, in puerperium, 219
Heart, thrombosis of, 550
Heel, diagnosis from elbow, 492
Hegar's dilators, description of, 357
uses of, 339, 348
sign of pregnancy, laxity of lower uterine wall, 64
Helme on involution of uterus, 214
Heredity, influence in insanity, 556
Hernia of gravid uterus, 280
umbilical, of fœtus, 265
Hicks, cephalotribe of, 388
method of version, 367
in treatment of placenta prævia, 349
Hips, delivery of, 139
History of previous labours, value of, in contracted pelvis, 440
Hook, blunt, in impacted breech presentations, 474
dangers of, 474
in version flexible, of Hicks, 369
Oldham's vertebral, 391
Ramsbotham's, 393
sharp, 393
vertebral, 391
Horn of uterus, rudimentary, pregnancy in, 322
Hospitals, antiseptics in lying-in, 182
puerperal fever in, 182
septicæmia in, 182
Hot water, injections of, 482
Hour-glass 'contraction' of uterus, 479
relaxation of uterus, 479
Humanised milk, 243
Humerus, injury to, in extraction, 200
Hydatidiform mole, see Vesicular Mole
Hydræmia during pregnancy, 56
Hydramnios, 257
albuminuria with, 258
cause of, 257
causing atony, 258
breech presentations, 258
dystocia, 258
inertia, 258
pendulous belly, 258
premature labour, 258
transverse lie, 467
definition of, 257
and diabetes, 257
diagnosis from ovarian cyst, 258
twins, 259
in ectopic gestation, 257
effect on fœtal heart-sounds, 258
involution, 258
lie of fœtus, 258
fœtus in, 257, 258
morbid anatomy of, 257
obscuring pregnancy, 258
prognosis of, 259
signs of, 258
symptoms of, 258
treatment of, 259
in labour, 259
in twin pregnancy, 257
Hydrocephalic skull, 263, 463
rupture of, 464
Hydrocephalus, 263, 463
breech presentation with, 168
causing rupture of uterus, 464
course of labour with, 464
diagnosis of, 464
mechanism of labour in, 464
prognosis in, 464
treatment of, 464
version in, 464
Hydrops amnii, see Hydramnios
Hydrorrhœa gravidarum, 247
causing premature labour, 247

Hydrorrhœa, diagnosis of, 247
treatment of, 248
Hydrostatic dilating bags, 358
Barnes's, 358
Champetier de Ribes', 359
Hydrothorax of fœtus obstructing delivery, 465
Hygiene of pregnancy, 76
Hymen, anatomy of, after connection, 67
after labour, 67, 212
before connection, 67
integrity of, after coitus, 67, 459
laceration of, during labour, 67, 212
rigidity of, 459
unruptured, at labour, 459
Hypertrophy of abdominal walls in pregnancy, 50
congenital, of cervix, 456
of heart during pregnancy, 56
Hypoblast, 7
Hysteria in pregnancy, 296
diagnosis from eclampsia, 511
in puerperium, 562
diagnosis, 563
Hysterotomy, see Cæsarian Section

Icterus in new-born child, 581
during pregnancy, 286, 298
connected with pernicious vomiting, 286
Iliac crests, distance, 416
spines, anterior superior, distance, 416
posterior superior, distance, 417
Ilio-sacral joint, ankylosis of, 445, 448
injury to, 501
in symphysiotomy, 402
Impaction of breech, 474
head in pelvic contraction, 428
forceps in, 442
Imperforate anus, 583
Impregnation, period of possible, 65
Incarceration of placenta, 479
of retroverted uterus, 273
in contracted pelvis, 428
Incision in atresia of genital canal, 455
in Cæsarian section, see Cæsarian Section
in cancerous cervix, 457
of perinæum, see Episiotomy
Inclination of pelvis, abnormal, 424
of symphysis, 419
of uterus to right, 41
Incomplete rupture of perinæum, 497
of uterus, 491, 492
Incontinence of fæces, 498
urine, 567
after labour, 567
due to fistula, 567
during pregnancy, 274, 275
Induction of abortion, 362, 365
of premature labour, 362
in contracted pelves, 439
time for, 439
in eclampsia, 512
methods of, 363
Inertia, 411
in accidental hæmorrhage, 338
causes of, 411
during dilatation, 412
during expulsion, 412
'secondary,' effects of, after delivery, 413
Inertia in multiple pregnancy, 204, 411
in placenta prævia, 345
treatment of, 411
Inevitable abortion, 306
detachment, zone of, 342
lacerations in primiparæ 67, 119, 191
Infant, artificial feeding of, 242
apparent death of, 518
asphyxia of, 518
care of, 240
caput succedaneum in, 119
circulation of, 235
diet of, 240
digestion of, 237
diseases of, 579
eyes of, 240
fæces of, 238
foramen ovale of, 235
icterus of, 581
mammary glands of, 239
management of, 240
navel of, 239
treatment of, 240
nursing of, 240
ophthalmia in, 580
treatment of, 580
respiration of, 237
selection of wet-nurse for, 241
skin of, 238
suckling of, 240
temperature of, 237
umbilicus of, 239
urine of, 237
weight of, 238
Infarct, placental, 26
renal, of uric acid in new-born child, 237
Infection of eyes of new-born, 580
of navel of new-born, 584
puerperal, 525
prevention of, 180
septic, of fœtus, 584
Infectious diseases, causing intra-uterine death 269
during pregnancy, 299
in puerperium, 544
Inflammation of breasts, 571
of new-born, 239
local specific, 541
of pleura, see Septicæmia
Inflation of chest at birth, 236
of fœtal lungs, artificial, 520, 522
Inhalation of chloroform, 205
of liquor amnii, 179
Inhaled matters, removal of, 520
Injection, antiseptic, see Douches
of anti-streptococcic serum, 540
of fluid into uterus for inducing labour, 363
Injections into bladder in cystitis, 567
intra-uterine, 227
causing of sudden death, 227
for induction of labour, 363
in post-partum hæmorrhage, 482
in septicæmia, 531
vaginal, for induction of labour, 363
in puerperium, 226
Injuries to cervix, 494
to genital canal, 489
of pelvic joints, 501
to perinæum, 496
to uterus, 489
against promontory, 273, 490
Inlet of pelvis, 81
diameters of, 83

Inoculation in septicæmia, 525
Insanitary conditions in septicæmia, 526
Insanity, 556
diagnosis of, 560
of labour, 558
during lactation, 559
of parturition, 558
of pregnancy, 557
pregnancy during, 560
of puerperium, 558
treatment of, 560
Insertion of cord, 27
central, 27
lateral, 27
marginal, 27
velamentous, 28
of placenta, 15
Insomnia in puerperal insanity, 559
Inspection of abdomen in pregnancy, 60
of vulva after delivery, 196
Inspiration at birth, 236
premature, in breech cases, 179
Instruments, disinfection of, 352
obstetrical, see Operations
Insufflation in asphyxia, 522
Intercourse, sexual, during pregnancy, 77
Inter-cristal measurement, 416
Interlocking of twins, 476
Intermittent fever during pregnancy, 301
Internal rotation, 135
causes of, 135
version, 368
Interspinous measurement, 416
anterior, 416
posterior, 416
Interstitial pregnancy, 317, 322
Intestine of new-born child in base of cord, 585
prolapse of, after uterine rupture, 491
Intoxication, septic, 527
Intra-abdominal pressure, see Labour
Intra-cranial hæmorrhage, 580
Intra-ligamentous pregnancy, 318
Intra-uterine death, 269
detachment of limbs, 260
douche, 227, 531
hæmorrhage, 336
irrigation, 227, 531
pressure, general, 102
rickets, 266
vaccination, 301
Intravenous saline injection, 360
Inversion of uterus, 486
causes of, 487
diagnosis of, 487
frequency of, 487
hæmorrhage in, 487
passive, 487
results of, 488
sequelæ of, 488
symptoms of, 487
treatment of, 488
Involution of broad ligaments, 215
cervix, 214
tubes, 215
uterus, 213
after abortion, 309
clinical course of, 213
vagina, 215
Iodine, compatibles with, 183
in pernicious vomiting, 285
Iodoform pessary, 252
Iron, injection of, into uterus, 483
Irrigation, see Douche
Irrigator, 185
Ischia, planes of, 82
spines of, 84
tuberosities of, 82
Ischio-pagus, see Labour with Monsters, 465
Isthmus of uterus, 42. See also Lower Segment of Uterus

Jaborandi, see Pilocarpin, 512
Jalap in eclampsia, 513
Jaundice in new-born child, 581
after late ligature of cord, 194, 582
with septicæmia, 582
theories of, 582
in pregnancy, 298
Jaw traction in pelvic lies, 201
injury to child during labour by, 202
Jelly of Wharton, 21
development of, see Changes in Ovum, 7
thickenings in, 28
Johnson's method of measurement of pelvis, 419
Joints, pelvic, 86
after labour, 216
during pregnancy, 48
rupture of, during labour, 501

Kidneys, disease of, in pregnancy, 506
acute, 505, 507
chronic, 505, 507
paraglobulin in urine in, 507
in eclampsia, 511
fœtal, and liquor amnii, 19
uric acid infarcts of, 237
Kiwisch's method of induction of labour, 363
Knee presentations, 168
diagnosis of, from shoulder, 471
Knee-elbow position in reposition of cord, &c., see Genu-pectoral
Knots of cord, 28
Kyphotic pelvis, 447
diagnosis of, 448
mechanism of labour in, 448
mode of production of, 447
treatment of, 448

Labia majora, hæmatoma of, 47
varicose veins in, 47, 283
minora, changes in, during pregnancy, 46
œdema of, 459
Labour, abdominal muscles in, 101
action of expelling forces in, 95
action of vagina in, 100
anæsthesia during, 190
antiseptics in, 180
anus in, 118
bag of waters in, 105, 112
blood, amount of, lost during, 127
causes of, 128
cervical dilatation in, 110
chloroform in, 190
in contracted pelvis, 428
contractions of uterine ligaments in, 100
uterus in, 96
course of, 109
date of labour, determination of, 65
death, sudden, of mother in, 502
definition of, 78
diagnosis of, commencing, 110
previous, 67, 224
recent, 223

Labour, duration of, 127
several stages of, 127
ether in, 205
examination during, 184, 187
expulsion of head in, 138
trunk in, 139
external rotation in, 138
factors of, 78
false, 71, 109
first stage of, anatomy of soft parts in, 115
bladder in, 115
duration of, 127
hæmorrhage in, normal, 127. See also Accidental Hæmorrhage and Placenta Prævia
induction of premature, 362
insanity of, 558
intra-abdominal pressure in, 101
irrigations in, 185
lacerations during, see Lacerations
list of articles required in, 185
management of, 180
first stage, 186
second stage, 190
third stage, 193
mania in, 553
mechanism of, see Breech, Brow, Face, Vertex, &c.
membranes in, 113
rupture of, 113
artificial, 189, 364
missed, 269
in multiple pregnancy, 203
normal, 78
definition of, 405
obstructed by atresia, see Atresia
cicatrices, see Cicatrices
rigid hymen, 459
perinæum, 459
effects of, constitutional, 408
local, 409
pains of, 96
action of, on uterus and contents, 102
pathology of, 405
placental stage of, 121
posture during, 186
precipitate, see Precipitate Labour, 406
premature, 303
induction of, 362
premonitory signs of, 109
preservation of perinæum in, 191, 192
processes of, epitome of, 78
progress of, 109
prolonged, 407
pulse in, 106
recent, signs of, 223
rectum during, 118
second stage of, 116
duration of, 127
typical pains of, 116
signs of previous, 223
spurious, 71
stages of, 109
first, 110, 186
second, 116, 190
third, 120, 193
sudden death in, 502
temperature during, 107
third stage of, 120
duration of, 127
management of, 193
time of commencement of, 128
termination of, 128
uterine tumours complicating, 455, 457
Labour with monsters, 465
twins, 203
Lacerations of cervix, 494
fascia, 495
hymen, in intercourse, 67
labour, 191
muscles of pelvic floor, 495
parturient canal, 196, 489
perinæum, 191, 196, 197, 496
immediate suture of, 197
sub-mucous tissues, 495
uterus, 489
vagina, 196, 494
vaginal orifice, 191, 196, 496
Lactalbumin, 242
Lactation, contraindications to, 231
diet during, 230
disorders of, 574
excessive quantity of milk in, 574
influence of, on involution, 231
insanity during, 559
management of, 231
means of arresting, 233
septicæmia, effect of, on, 529
Lacteal fistula, 572
Lactiferous ducts, plugging of, 233, 572
Lactose in milk, 242
Lambdoidal suture, 92
Laminaria tents, 356
in dilating cervix, 356
disinfection of, 357
Lanugo, 31
Laparotomy, 394
after rupture of uterus, 399
in ectopic gestation, 330
in puerperal fever, 530
Lateral flexion of head in normal labour, 137
trunk in head presentation, 139
obliquity of head, 135, 137
placenta prævia, 341
Leg, absence of one, in pelvic deformity, 445
selection of, in version, 369
thrombosis of veins of, 548
varices of, 50
Length of fœtus at term, 30
Leucocytosis of pregnancy, 56
Levator ani, anatomy of, 87
rupture of, 496
spasm of, 459
Lever action of forceps, 384
head of fœtus as, 133
Liberation of arms, 200
Lichen in new-born child, 583
Lie of fœtus, cause of, 34
cephalic, 32, 129
proportion of, 34
changes of, 35
definition of, 32
diagnosis of, 149
influence of pelvis on, 35, 427, 428
instability of, 35
longitudinal, 32
pelvic, 32
podalic, 32, 168
transverse, 466
Life of fœtus, diagnosis of, 62
Ligaments, broad, involution of, 213
in labour, 100
relations of, after labour, 213
during pregnancy, 47
round, changes in, during pregnancy, 48
contraction of, in labour, 100
sacro-sciatic, see Development of Pelvis, 422

Ligature of cord, early, 193, 238
late, 193, 238
with twins, 204
vessels in umbilical hæmorrhage, 518, 585
Limb, one, disuse of, causing deformity of pelvis, 445
Limbs, fœtal, intra-uterine, amputation of, 260
presentation of, 475, 476
prolapse of, 476
recognition of, in abdominal examination, 151
twisting of cord round, 478
of woman, paralysis of, 563
Lime, chloride of, in disinfection, 182
Lineæ albicantes, gravidarum, maternæ, see Striæ
Lip, anterior cervical, during labour, 115, 190
Liquor amnii, 19
abnormal, 257, 259
absorption of, after death of fœtus, 270
albumin in, use of, 20
action of, in labour, 20, 105
composition of, 19
deficiency of, 259
derivation of, 19
discharge of, 113
premature, 114
discolouration of, 29, 257
excess of, see Hydramnios, 257
causing podalic lie, 169
inhalation of, 179
insufficiency of, 259
origin of, 19
quantity of, 19
variations in, 19, 29
scantiness of, 259
adhesions in, 260
fœtus in, 259
intra-uterine amputations in, 260
resembling ectopic gestation, 259
sugar in, 257
urea in, 19
uses of, 20
variations in colour, 29
quantity, 19
List of special requisites for labour, 185
Lithopædion, 320
formation of, 320
Lithotomy during labour, 460
-position during operations, 498
Liver, acute atrophy of, in pregnancy, 284, 286
changes in, in pregnancy, 284, 286
syphilitic changes in fœtal, 268
Living fœtus, diagnosis of, 62
Lochia, 215, 216
abnormalities of, 576
composition of, 216
definition of, 216
excessive, 576
offensive, 528, 577
quantity of, 217
return of, 230, 576
in septicæmia, 528
sudden arrest of, 529, 577
Locking of forceps, 381
twins, 476
decapitation in, 393
'Longings' during pregnancy, 54
Longitudinal lie, 32
Loop of cord round child, 192
Lordosis of spine, 424
Lower segment of uterus, 42, 98
boundaries of, 42, 98
laxity in pregnancy, Hegar's sign, 64
Lower segment of uterus, in placenta prævia, see Placenta Prævia
placental insertion on, see Placenta Prævia
rupture of, 490
Lubricant for fingers and instruments, 184
Lumbar vertebræ, prolapse of, in spondylolisthesis, 452
Lumbo-sacral cord, pressure upon, 563
Lumps, axillary, 58
Lungs, diseases of, in pregnancy, 297
effects of pregnancy on, 56
inflammation of 297
inflation of, at birth, 236
artificial, 520, 522
in puerperal septicæmia, 540
Luteum corpus, 2
Lying-in hospitals, antiseptics in, 182
puerperal septicæmia in, 182
contracted pelvis, effect of, on, 432
room, arrangements of, 180
period, see Puerperium
Lymphangitis, 534
Lymphatics of uterus in pregnancy, 44
septicæmia, 534

MACERATION of fœtus, 270
Malacosteon, see Osteomalacia, 299
Malaria in pregnancy, 301
Malformations of fœtus, 263, 465
pelvis, 424
uterus, 293
affecting labour, 459
vagina, 458, 459
Malignant disease in pregnancy, of cervix, 290
uterus, 290
vagina, 291
Malposition of os uteri, 273, 454, 455
Malpresentations, causes, see various kinds of Malpresentation
Malted foods, 242
Mamma, see Mammary Gland
Mammary gland, abscess of, 571, 572
affections of, 569
after delivery, 217
alternate use of, 232
areola of, in pregnancy, 53
secondary, 54
care of, during pregnancy, 77
cleansing of, after nursing, see Nipples
diseases of, 569
examination of, in wet-nurses, 241
inflammation of, 571
lineæ on, in pregnancy, 53
in new-born child, 239
in pregnancy, 52
changes in, after death, of ovum, 270
in puerperium, 217
secretion of, after delivery, 217
changes in the characters of, in pregnancy, 54
in puerperium, 217
effects of drugs on, 218
excessive, 574
scanty, 232, 575
treatment of, 575

Mammary gland, signs of pregnancy in, 53
striæ of, 53
Mania with chorea, 280
during delivery, 558
lactation, 559
pregnancy, 557
puerperal, 558
Marasmus from uncontrollable vomiting, 284
Marginal insertion of cord, 27
placenta prævia, 342
Marshall Hall's method of artificial respiration, 520
Mastitis, causes, 571, 527
treatment, 573
varieties, 572
Maturity of fœtus, signs of, 30
Meals, arrangement of, for infants, 231, 240
Measles during pregnancy, 301
Measurement, see also Pelvimetry
of brim of pelvis, 83
cavity of pelvis, 84
diagonal conjugate, 83
external conjugate, 85
fœtal head, 91
fœtus, 91
iliac crests, 85
iliac spines, 85
pelvic outlet, 84
pelvis, 83
pelvis, table of, 84
true conjugate, 83
uterus during pregnancy, 36
Mechanism of labour, see under respective headings
Meckel's diverticulum, 584
Meconium, composition of, 238
discharge of, after delivery, 238
in asphyxia, 29
in liquor amnii, 29
Melancholia during lactation, 560
pregnancy, 557
puerperium, 559
Membranes, abnormalities of, 246, 252, 257
action of, on cervix, 105
anatomy of, in multiple pregnancy, 73
bag of, 104
second, 113, 114
delayed rupture of, 114, 125
detachment of, 124
examination of, 196
expelled unruptured, 115
expulsion of, 125
fibrous masses in, 28
functions of, 104
in pelvic contraction, 428
prolapse of, 115
puncture of, in accidental hæmorrhage, 339
retention of, in abortion, 307
after labour, 576
rupture of, 113
artificial, 189, 339
delayed, 114, 125
in accidental hæmorrhage, 339
in inertia, 412
modes of, 113
premature, 113, 114, 124
spontaneous, 113
separation of, from uterus, 121, 124
at term, 18
in transverse presentation, 467
two bags of, in twins, 203
wrinkling of, in separation, 124
Membranous placenta in placenta prævia, 341
Meningeal hæmorrhage, 108, 580
Meningocele, 264
Menopause and pseudo-cyesis, 71
Menorrhagia after abortion, 307
Menstruation in calculation of date of delivery, 65
cessation of, in pregnancy, 58
continuance of, in pregnancy, 58
in ectopic gestation, 324
Mental activity in new-born child, 239
Mental disorders, see Insanity
Mento-posterior positions, management of, 199
unreduced, 163
Mercurialism after douching with sublimate solutions, 226
Mercury, see Sublimate, Corrosive
Mesoblast, 7
Metritis after delivery, 532
Metrorrhagia after abortion, 307
Micro-organisms in erysipelas, 542
gonorrhœa, 541
sapræmia, 527
scarlatina, 545
septicæmia, 526
Micturition, difficulty of, after delivery, 230
during pregnancy, 50
Milk, addition of cream to, 243
arrest of secretion of, 233
artificial human, 243
asses', 242
in breasts of new-born children, 239
casein, removal of, from, 243
condensed, 244
cow's, 242
composition of, 242
curdling of, 242
deficiency of, 575
dilution of, 243
ducts, obstruction of, 572
excess of, 574
-fever, 218
fistula, 572
globules, 218
human, characters of, 218
composition of, 218
changes in, 219
humanised, 243
in new-born children's breasts, 239
-leg, see Phlegmasia Alba Dolens
method of arresting secretion of, 233
of goat, 242
of mare, 242
peptonised, 243
preparation of, for infants, 242
proteids of, 242
kinds of, 242
quality of, determination of, 219
reaction of human, 242
secretion of, 217
defective, 232, 575
effect of drugs on, 219, 575
excessive, 574
in women not pregnant, 71
sterilisation of, 243
sugar, amount of, in, 218
Swiss, 244
Miscarriage, see Abortion and Premature Labour
Missed abortion, 250, 251, 269
labour, 269
miscarriage, 250, 251, 269
Mitral disease
in labour, 503
pregnancy, 296
Mobility of fœtal head on trunk, 78
pelvic joints, 86
abnormal, 568
Mole, carneous, 248

Mole, carneous, causes of, 248
causing hæmorrhage, 251
decomposition of, 250
diagnosis of, 251
ectopic, 317, 322
expulsion of, 250
putrefaction of, 250
signs of, 251
symptoms of, 251
treatment of, 252
cystic, hydatidiform, vesicular, 252
anatomy of, 253
definition of, 252
diagnosis of, 255
causation of, 252
embryo in, 254
expulsion of, 255
evacuation of uterus in, 256
fœtus in, 254
fœtal heart in, 255
hæmorrhage in, 255
septicæmia from, 255
size of uterus in, 254
symptoms of, 254
treatment of, 255
in twin pregnancy, 252
villi of, perforating uterine wall, 254
Mollities ossium, pelvis of, 449
Monsters, acardiac, 74
anencephalic, 263
classification of, 465
causing difficult labour, 465
diagnosis of, 465, 466
double, 465
management of labour with, 466
presentations of, 466
varieties of, 465
Morbility of child-birth, 182
Moribund woman, Cæsarian section in, 395
Morning-sickness in pregnancy, 55, 59
excessive, 284
treatment of, 285
pernicious, 284
uncontrollable, 284
Morphia in eclampsia, 513
in ectopic gestation, 330
Mortality of child-birth, 182
Moulding of head, 140
disappearance of, after delivery, 239
during delivery, see the several presentations
in Contracted Pelvis, 431
Mouth of infant, cleansing of, after meals, 244
Movements of coccyx, 86
fœtal, cessation of, 270
earliest, 59
of pelvic joints, 86
of sacrum, 86, and see Appendix B
Multipara, definition of, 109
floor of pelvis in, 67
labour in, length of, 127
perinæum in, 67
quickening in, 59
Multiple pregnancy, 72
acardia in, 74
development of children in, 74
diagnosis of, 75
frequency of, 72
fœtus papyraceus in, 74
Multiple pregnancy, hæmorrhage after, 204, 480
inertia in, 203
interlocking of fœtuses in, 476
interlocking of fœtuses, treatment of, 477
labour in, 203
mode of production of, 73
mummification of fœtus in, 74
number of fœtuses in, 72
premature labour in, 203
presentations in, 204
prognosis in, 203
sex of fœtuses in, 74
superfecundation in, 73
superfœtation in, 76
varieties of, 72
Mummification of fœtus, 270, 320
Münchmeyer's method of transfusion, 486
Muscles, abdominal, action of, in labour, 100
action of, in development of normal pelvis, 421
of deformed pelvis, 424
of pelvic floor, 86
sterno-mastoid, injury to, 581
tone of, in asphyxia of fœtus, 520
uterine, condition in contraction, 96, 97
relaxation, 97
retraction, 97
pregnancy, 41
involution of, after labour, 214
Myoma, causing hæmorrhage, 288, 336, 455
inertia, 455
inversion, 487
placenta prævia, 288, 455
post-partum hæmorrhage, 455
rupture, 455
cervical, complicating pregnancy, 289
corporeal, 289
diagnosis of, 289
from ectopic gestation, 328
pregnancy, 69
Myxoma fibrosum of chorion, 261

Nabothian follicles, 46
Nägele, oblique pelvis of, 445
obliquity of fœtal head, 135, 433
in pelvic flattening and contraction, 433
Nails, cleanliness of, 184
Narcotics in accidental hæmorrhage, 339
exhaustion, 412
insanity, 561
threatened abortion, 310
See also Anæsthesia
Naso-frontal suture, 92
Nausea in pregnancy, 55
Navel, see Umbilicus
Neck, division of, see Decapitation
emphysema of, 502
traction on, in delivery of head, 193
Nephritis, see Albuminuria
Nerves, injury to, in delivery, 563
of uterus, changes in pregnancy, 44
Nervous disorders of pregnancy, 54, 280. See also Insanity, Chorea
Nervous system, changes in, in pregnancy, 54
Neuroses during pregnancy, 54, 280
puerperium, 556
New-born child, activity of senses in, 239
albuminuria in, 237
alimentary system in, 237
apnœa of, 518

New-born child, application of, to breast, 231
artificial feeding of, 242
asphyxia of, 518
brachial plexus, damage to, by forceps, 579
breasts of, 239
secretion by, 239
caput succedaneum of, 119
care of, 240
changes in circulation of, 236
skin of, 238
circulation in, 235
clothing of, 240
colic in, 583
desquamation in, 238
digestion in, 237
eyes of, 240
facial nerve, paralysis of, 579
fæces of, 238
first respiration of, 236
food of, 240, 241, 242
gain of weight in, 238
hæmorrhages in, 108, 580
hand-feeding of, 242
icterus of, 238, 581
jaundice in, 238. 581
loss of weight in, 238
mammary glands of, 239
management of, 240
meconium of, 238
mental activity of, 239
navel of, 239, 240
ophthalmia in, 240, 580
pancreas of, 238
paralysis of facial nerves in, 579
pathology of, 579
preparation of milk for, 242
puerperal infection of, 584
renal secretion in, 237
respirations of, 237
salivary glands of, 238
senses of, 239
septic infection of, 584
skin of, 238
stomach of, 238
suckling of, 231
temperature of, 237
tetanus of, 580
umbilical cord in, 239, 240
urine of, 237
vision in, 239
washing of, 240
weight of, 238
wet-nurse for, 240
Nipping of soft parts in labour, 428, 429
Nipple, changes in, during pregnancy, 54
cracked, 232, 233, 570
depressed, 569
eczema of, 575
erectility of, 54
erosion of, 570
fissure of, 570
management of, in pregnancy, 77, 570
suckling, 232
retracted, 569
-shield, 233, 570
sore, 570
infection of breast through, 572
treatment of, 233, 571
ulceration of, 571
Nodules in placenta, 26
Nozzle for douche, 227
Nullipara, uterus of, 225
Nulliparity, signs of, 67, 224
Nurse, selection of wet-, 241
Nursing, contraindications to, 231. See Suckling
Nutrition of fœtus, 238
Nymphæ, injury to, 501

Oblique contraction of pelvis, 443
diameters, 83, 84
pelvis, 443
Obliquely contracted pelvis, 443
causation of, 443
diagnosis of, 446
labour in, 447
treatment of labour in, 447
varieties of, 443, 444, 445
Obliquity, anterior parietal, 433
of fœtal head, biparietal, 433, 436
posterior parietal, 436
Nägele's, 135, 433
Roederer's, 133
Solayres', 130
of uterus, causing extension, 154
causing face presentations, 154
causing flexion, 133
causing transverse presentations, 467
Obliteration of cervix, 110
of fœtal blood channels, 237
Obstetrical conjugate, 83
examination, external, 150
internal, see Various Lies and Positions
history, 72, 440
operations, 352
Obstructed labour by abdominal swellings in fœtus, 465
by abnormal fœtus, 462
by ascites of fœtus, 465
in atresia, uterine, 456
vaginal, 458
vulvar, 459
by broad shoulders, 462
by coiling of cord, 78
by cystocele, 457
by displaced arm, 475
by displacements, uterine, 454, and see Anteversion
by distended bladder, 460
by ectopia viscerum, 465
by fibroids, 455
by hydrocephalus, 463
by hydrothorax, 465
by hypertrophy of cervix, 456
by locked twins, 476
by malformation of uterus, 459
by malformation of vagina, 459
by monsters, 465
by morbid growths, 457
by ovarian tumours, 460
by rigid hymen, 459
perinæum, 489
Obturator foramen, 82
muscles, 86
Occipital bone, rupture of, 431
Occipito-anterior position, 132
flexion of head in, 132
mechanism in, 132
Occipito-frontal diameter, 93
Occipito-posterior position, causes of unreduced, 143
forceps in unreduced, 198

Occipito-posterior position, management of unreduced, 197
mechanism in, 145, 147
mechanism in rarer form of, 147
moulding of head in, 148
prognosis in unreduced, 177
rotation in, 145
rotation as treatment for, 197
vectis in, 198
Occlusion of cervix, 455
vagina, 458
vessels and blood channels after birth, 15, 127
Œdema of anterior lip of cervix, 115, 190
in albuminuria, 507
of fœtus, 268, 465
generative organs during pregnancy, 283
with hydramnios, 268
of incarcerated uterus, 274
new-born child, 584
placenta, 268
Oïdium albicans, 583
One-horned uterus, 294
Operations, obstetric, 352
Ophthalmia neonatorum, 580
prophylaxis of, 240
treatment of, 580
Opium in eclampsia, 513
exhaustion of uterus, 412
threatened abortion, 310
Orifice of urethra in labour, 118
Os uteri, dilatation of, 356
dilation of, 104, 112
displacement of, anterior, 455
posterior, 454
internum, after labour, 214
definition of, 45
dilation of, in labour, 104, 112
pregnancy, 45
occlusion of, 455
relation to retraction ring, 45
rigidity of, 456
stricture of, 456
Ossification of skull in successive pregnancies, 440
Osteomalacia, 449
pelvis of, 449
in pregnancy, 299
Osteophytes, 57
Outlet of pelvis, measurements of, 84
in various deformities, see under special headings
Ova, description of, 2
number of, in ovaries of young girl, 1
Ovarian cyst in labour, 460
in pregnancy, 291
diagnosis of, 292
removal of, 292
rupture of, 292
tapping of, 292, 461
twisting of pedicle of, 292
Ovaries, anatomy of, in lying-in period, 212
pregnancy, 48
corpus luteum of, 2
discharge of ovum from, 2
extirpation of, in Porro's operation, 401
effect on osteomalacia, 401
follicles of, 1
Ovaries, tumours of, in labour, 460
in pregnancy, 291, see also Ovarian Cyst
Overlying, 232
Ovula Nabothi, 46
Ovulation, cessation of, in pregnancy, 76
Ovum, aborted, 304
affections of, 246
anatomy of, at different months of pregnancy, 29
changes in, after fecundation, 7
detachment of, causing hæmorrhage, 305
development of, in ectopic gestation, 316
discharge of, from ovary, 2
diseases of, 246
expulsion of, in abortion, 305
entire, 115
modes of, 306
hæmorrhage into, 248
premature expulsion of, 303
retention of, when dead, 249, 270
rupture of, in carneous mole, 249
segmentation of, 7
size of, at different periods, 29
with two yelks, 73
Oxygen inhalation in pulmonary embolism, 552
supply to fœtus, 22
Oxytocics in abortion, 313
in accidental hæmorrhage, 339
after normal labour, 231
in inertia, 412
placenta prævia, 350
post-partum hæmorrhage, 484, and see Ergot

Pack, wet, in eclampsia, 512
Packing of vagina, see Plugging
Pad, absorbent, during puerperium, 228
materials for, 228, 229
Pain, cause of, in labour, 97
Pains, see also Contractions, Uterine
abnormalities, 411
action of, on fœtus, 103
placenta, 106
uterus, 90, 106, 111
after-, 208
false, 109, 186
of first stage, 111
psychical influence on, 107
relation to fits in eclampsia, 510
of second stage, 116
spurious, 109
weak, see Inertia
Palpation of abdomen, 150
placenta, 346
Pampiniform plexus, thrombosis in, 536
Papyraceus, fœtus, 74
Paraglobulin in urine, 507
estimation of, 507
Paralysis of bladder after delivery, 567
from cerebral hæmorrhage, 563
of facial nerve from forceps, 579
of legs after delivery, 563
from pressure on lumbo-sacral cord, 563
Parametric abscess, 533
inflammation, see also Parametritis
contraction after, 533
diagnosis from ectopic gestation, 328
Parametritis, 532
anterior, 533
during pregnancy, 288
extension of, 532
remote, 353

Parametritis in septicæmia, 532
suppuration of, 533
symptoms of, 535
treatment of, 537
Parietal bone, fracture of, in contracted pelvis, 431
Parietal bone, presentation of anterior, 134, 433
posterior, 436
Parity, diagnosis of, after death, 224
during life, 67
Parous uterus, characters of, 224
Partial placenta prævia, 341
Parturient canal, see also Vulva, Vagina, Cervix, Uterus
axis of, 80
bony, 79, 81
description of, 79
disinfection of, 184, 188
lacerations of, 489
ruptures of, 489
Parturition, see Labour
Partus corpore conduplicato, 471
Patches, brown, in pregnancy, 57
Pathology of labour, 405
of new-born child, 579
of pregnancy, 246
of puerperium, 524
Pedicle of ovarian cyst, injury to, in labour, 460
twisting of, 292
Peeling off placenta, 479, 480
Pelvic articulations, see Articulations
bones, 81
softening of, in osteomalacia, 449
tumours of, 454
brim, 81
cavity, 82
cellulitis, see Parametritis
contraction, see Contraction of Pelvis
floor, after labour, 212
description of, 86
in second stage, 116, 117, 118
joints after labour, 216
levers, 422
lie, 168
prognosis in, 178
measurement, see Measurements of Pelvis and Pelvimetry
organs after labour, 210
outlet, 82
peritonitis, see Perimetritis
presentations, see Breech Presentation
tumours, 454
veins in pregnancy, 50
walls, 82
Pelvimetry, 416
external, 416
direct, 419, 420
indirect, by fœtal head, 420
internal, 417
Johnson's method of, 419
value of, in practice, 420
Pelvis, abnormal, 415
definition of, 415
adult, development of, 421
æquabiliter justo minor, see Generally Contracted Pelvis, 425
anatomy of, 81
articulations of, 86
relaxation of, 569
rupture of, 501
axis of, 80
bones of, 81
brim of, 81
canal of, 79
cavity of, 82
of child, 421
conjugate of, 83
Pelvis, connective tissue of, 532
contracted, see Contraction of Pelvis
deformities of, see Contraction of Pelvis
development of, 421
body-weight in, 421, 422, 423
factors in, 421
diameters, 83, 416
effect of symphysiotomy on, 403
dilatation of, in osteomalacia, 451
exostoses of, 454
external measurements of, 85
fascia of, 89
fissured, see Split Pelvis, 425
flat, see Flat Pelvis
floor of, 86, 212
fascia of, 89
forceps at brim of, 374, 442
generally contracted, see Generally Contracted Pelvis
inclination of, in development, 424
'inclined planes' of, 82
infantile pelvis, 421
injury to joints of, 501
inlet of, 81
diameters, 83
shape, 81
joints of, changes in, after labour, 216
in pregnancy, 48
description of, 86
kyphotic, see Kyphotic Pelvis
malacosteon, see Osteomalacia
malformations, see Various Deformities
measurements of, see Measurements of Pelvis and Pelvimetry
muscles of, 86
Nägele's, 445
obliquely contracted, 443
outlet of, 82
planes of, 82
reniform, 426
ricketty, see Ricketty Pelvis
rupture of articulations of, 501
straits of, 82
tumours of, 454
valves of, 118
walls of, 82
Pemphigus in new-born, 583, 585
Pendulous belly, causing rupture of vagina, 273
due to anteversion, 271
lordosis, 272
pelvic contraction, 271, 427
scoliosis, 272
results of, 272
signs of, 272
symptoms of, 272
treatment, 273
Pendulum movement of forceps, 384
Peptonisation of milk, 243
Peptonuria, 223
Perchloride of iron as hæmostatic, 483
mercury, use in midwifery, 184
Perforating rupture of uterus, 491
Perforation of fœtal head, 387
continuance of life after, 388
of dead fœtus, 442
extraction after, 338, 391
in face presentation, 164
indications for, see Craniotomy
method of performance of, 387
of membranes, 364

Perforation of perinæum, 496
of placenta prævia, 349
of uterus, 491
Perforator, Oldham's, 387
Perimetritic group of septic affections, 534
Perimetritis, after abortion, 309
delivery, 534
due to gonorrhœa, 541
during pregnancy, 287
symptoms of, 535
treatment of, 537
Perinæum, cicatrices of, 459
distension of, 117, 190
examination of, after delivery, 196
incisions into, 192, 459
in labour, 190
lacerations of, 68, 496
œdema of, 459
post-partum condition of, 215
preservation of, 190
rigidity of, 459
rupture of, 496
central, 496
frequency of, 495
method of, 497
from precipitate labour, 496
prophylaxis of, 190, 191
treatment of, 498
varieties of, 496, 497
support of, 190
tearing of, in normal labour, 119
Perineal bandage in prolapse of vagina, 279
body after labour, 215
Peristaltic contractions of uterus, 96
Peritoneum, elasticity of, 100
inflammation of, see Peritonitis
pelvic, changes in, in pregnancy, 47
after labour, 213
Peritonitis after injection of perchloride of iron, 483
after uterine rupture, 492
pathology of, 538
pelvic, see Perimetritis
in puerperal septicæmia, 538
symptoms of, 538
treatment of, 539
Permanganate of potash, compatibility, 183
Pernicious anæmia in pregnancy, 282
Pessary in Cæsarian section, 395, 397
retroversion of gravid uterus, 276
Phlebitic septicæmia, 536
Phlebitis after delivery, 533
umbilicalis, 584
Phlebotomy in eclampsia, 513
Phlegmasia alba dolens, 553
œdema in, 554
pathology of, 553
prognosis of, 554
symptoms of, 554
treatment of, 554
Phlegmon in septicæmia, 535
Phthisis, nursing in, 232
in pregnancy, 297
induction of labour in, 297
Physometra, 502
causation, 502
treatment, 502
Pigment, deposition of, in placental site, 215
Pigmentation of abdomen, 57
areola, 53
face, 57
Piles in pregnancy, 283
Pillow after labour, 229
Pilocarpin in eclampsia, 512
Placenta, accessory, 23
adherent, 479
Placenta, adherent, signs of, 479
adherent to fœtus, 260
anatomy of, 15
apoplexy of, 261
arteries of, thrombosis of, 26
artificial detachment of, 479, 480
battledore, 27
born before child, 344, 491
bruit of, supposed, 62
calcareous degeneration of, 27
calcification of decidua of, 27
changes in, after death of fœtus, 270, 317
circulation in, 14
'collerette' of, 23
cotyledons of, 13
cysts of, 27, 261
degeneration of, 27
description of, at term, 15
detachment of, 121
detrusion of, 122
development of, 11
commencement of, 15
diagnosis of position of, 346
diseases of, 260
ectopic, see Ectopic Gestation, 313
examination of, 196
expression of, 195
expulsion of, 125
shape during, 126
extraction of, 479, 480
fatty changes in, 261
fibrous masses in, 26, 261
fœtal part of, 13
functions of, 22
gelatinous layer of, 18
hæmatoma of, 261
hæmorrhage into, 261
in multiple pregnancy, 73, 203, 204
insertion of, 15
lacunæ of, 11
lobed, 23
marginal sinus of, 17
maternal part of, 11
diseases of, 260
inflammation of, 260
membranous, see Placenta Prævia
morbid adhesion of, 261, 479
myxoma fibrosum of, 261
normal insertion of, 15
partial detachment of, 479
pathology of, 260
perforation of, in placenta prævia, 349
in placenta prævia, 341, 343
prævia, 341
abnormal presentations in, 344
causes of, 341
causing malpresentations, 169
cervix uteri in, 345
definition of, 341
diagnosis of, 345
dilatation of cervix in, 347, 348
effect of, on labour, 344
pregnancy, 344
puerperium, 345
forceps in, 347
frequency of, 341
hæmorrhage in, 342, 344
hæmorrhage in, before labour, 343
inertia in, 345
lower segment of uterus in, 341, 345
management of, 346
placenta in, 341, 343
placenta, total separation of, in, 344

Placenta prævia with placenta succenturiata, 341
progress of labour in, 344
prolapse of cord in, 345
septicæmia after, 345
syncope after, 345, 350
treatment of, 346
varieties of, 341
version in, 349
zones of uterus in, 342
prolapse of, 344, 491
removal of, from vagina, 195
retention of portions of, 196, 526
whole, 478
sclerosis of, 262
separation of, 121
modes of, 121
sinuses of, 11
site of, normal, 15
reduction of, causing separation, 121
souffle of, supposed, 62
structure of, 11, 15
succenturiata, 23
evidence of, 23
surface, fœtal, 16
maternal, 16
syphilis of, 262
term, at, 15
thrombosis of, 26, 261
treatment of, in Cæsarean section, 398
villi of, 15
degeneration, vesicular, of, 252
myxoma fibrosum in, 261
sclerosis of, 262
vein, coronary of, 17
vessels of, dilatation of, 26
erratic, 24
Placental area, 15, 209, 212
during separation, 121
hæmorrhage, 261
period, 120
inertia during, 479
management of, 195
polypus, 308
site, 15
after delivery, 209, 212
atony of, 487
diagnosis of, 346
hæmorrhage from, see Accidental Hæmorrhage, Placenta Prævia, Post-partum Hæmorrhage
post-partum changes in, 213
reduction of, causing separation, 121
Placentitis, 260
Planes, inclined, of pelvis, 82
Pleurisy in septicæmia, 540
Pleuritic effusion in fœtus, 465
Plugging of cervix, 356
in abortion, 311
in placenta prævia by elastic bags, 349
in placenta prævia by half-breech, 349
in placenta prævia by tents, 348
pulmonary artery, 551
uterus, 354, 483
vagina, 353
in abortion, 311
placenta prævia, 348
Plural pregnancy, 73
Pneumonia in pregnancy, 297
septicæmia, 540
Podalic lies, 168
moulding of head in, 176
prognosis in, 178
version, 366
Podalic version, extraction after, 369
in pelvic contraction, 442
after perforation, 391
before craniotomy, 392
for prolapsed cord, 517
in transverse lie, 473
Polarity of uterus, 99
Polygalactia, 575
Polypus, fibrinous, 308
fibroid, causing hæmorrhage,
diagnosis from inversion, 488
in labour, 455, 457
mucous, in pregnancy, 288
placental, 308
Porro's operation, see Cæsarian Section
Portal vein, 235
Portio vaginalis, annular laceration of, 494
cancer of, in labour, 457
pregnancy, 290
changes in pregnancy, 44
injuries to, in labour, 68
Position of breech, 169,
fœtus in utero, 32
definition of, 32
diagnosis of, 149
by abdominal examination, 150
by palpation, 150
by vaginal examination, see several positions
head, anterior parietal, 433
diagnosis of, 434
mento-posterior, unreduced, 163
occipito-anterior, 132
-posterior, 143
-posterior unreduced, 144
posterior parietal, 436
uterus in pregnancy, 39
puerperium, 210, 576
woman, knee-elbow, 277
lithotomy, see Rupture of Perinæum
obstetrical, 137
semiprone, 277
Walcher's, see Appendix
Posterior parietal obliquity, 436
superior spines, distance, 85, 417
Post-mortem signs of delivery, 224
Post-partum hæmorrhage, 480
after accidental hæmorrhage, 338, 340
causation of, 480
in placenta prævia, 345
prophylaxis, 186
secondary, 486
transfusion of saline fluid in, 486
treatment, 481
Post-partum period, see Puerperal State
Postural treatment in mento-posterior cases, 199
presentation of cord, 515
prolapse of cord, 516
retroverted pregnant uterus, 277
Posture during parturition, 187
genu-pectoral, 277, 515, 516
Potassium bromide, 513
Prague method of extraction of after-coming head, 201
Precipitate labour, 406
causes of, 406
causing rupture of cord, 407
causing rupture of perinæum 406

Precipitate labour, chloroform in, 407
definition of, 406
effect on fœtus, 406
mother, 406
treatment, 407
Pregnancy, abdominal, see Ectopic Gestation
abdominal walls in, 50
abnormalities of uterus in, 75
acardia in multiple, 74
accidental complications of, 287
accidental hæmorrhage in, 336
acute infectious diseases during, 299
ague in, 301
albuminuria in, 57
alimentary system in, 57
amaurosis in, 56
amenorrhœa in, 58
anæmia in, 56
pernicious, 282
anæsthesia in, 56
anteflexion in, 39, 271
anteversion in, normal, 39
aortic disease in, 296
appetite in, 55
areola in, 53
attitude of woman in, 60
auscultation in, 61
axillary lumps in, 58
ballottement in, 64
bladder, disorders of, in, 287
blood in, 56
bowels in, care of, 76
breasts in, 52
bronchitis in, 298
brown patches in, 67
cancer of cervix during, 290
treatment of, 290
vagina, 291
carbon dioxide, increase of, in, 57
cardiac diseases in, 296
care of nipples in, 77
cervix in, 44
catarrh of, in, 288
mucous polypus of, in, 288
chlorosis in, 282
cholera in, 302
chorea in, 280
coiling of cord in, 192
coitus in, 77
complications of, see under various headings
constipation in, 57, 76
contractions of uterus in, 38
date of delivery in, calculation of, 65
deafness in, 56
diabetes in, 298
insipidus in, 299
diagnosis between first and subsequent, 67
diagnosis of, 58
date of, 65
death of fœtus in, 71, 270
differential, 69
multiple, 75
diaphragm in, 57
digestion in, 57, 284, 286, 298
dilatation of heart in, 56
diseases and disorders of, 271
dress during, 76
dropsy in, 507
of amnion in, 257
duration of, probable, 65
dyspepsia in, 286
ectopic, 313
effect of, see special organs and systems affected
Pregnancy, endometritis in, 246
enterica in, 300
epilepsy in, 296
exanthemata in, 299
exophthalmos in, 56, 297
extra-uterine, see Ectopic Pregnancy
fevers, specific, in, 299
fibroids complicating, 288
fœtal heart-sounds in, 62
movements in, 63
funic souffle in, 63
gingivitis in, 57, 286
glycosuria in, 57
hæmorrhage in, 335
hæmorrhoids in, 283
heart in, 56
heart-disease in, 296
Hegar's sign of (laxity of lower uterine wall), 64
hernia in, of uterus, 280
hydræmia in, 56
hydramnios in, 257
hydrorrhœa in, 247
hygiene of, 76
hymen in, 67, 459
hypertrophy of heart in, 56
hysteria in, 296
icterus in, 286, 298
increase in size of abdomen in, 40
in double uterus, 75, 76, 294
in one-horned uterus, 294
in rudimentary horn, 322
influence of pelvic contraction on, 427
insanity in, 557
inspection of abdomen, &c., in, 60
interstitial, 317, 322
jaundice in, 298
longings of, 55
lumps, axillary in, 58
malacosteon in, 299
malaria in, 301
malformed uterus in, 293
mammæ in, 52
management of, 76
mania in, 557
measles in, 301
menstruation during, 335
suppression of, during, 58
methods of examination in, 60
metritis in, 287
mitral disease in, 296
molar, 248, 252
morning sickness in, 55, 59
movements of fœtus in, 61
multiple, see Multiple Pregnancy, 72
myomata complicating, 288
nausea in, 55
navel in, 60
nephritis in, see Albuminuria
neuroses in, 54, 56, 280
nipples in, 54, 77
nutrition in, 57
œdema in, 283
osteomalacia in, 299
osteophytes in, 57
ovarian, see Ectopic Gestation
ovarian tumours in, 291
diagnosis of, 292
palpation of abdomen in, 60
parametritis in, 288
pareses in, 56
patches, brown, in, 57
pathology of, 246
pelvis, contracted, in, 427
perimetritis in, 287

Pregnancy, period of, calculation, 65
pernicious anæmia in, 282
phthisis in, 297
physical examination in, 60
physiology of, 1
pigmentation in, 57
piles in, 283
pneumonia in, 297
portio vaginalis during, 44
prolapse of uterus in, 278
diagnosis of, 279
treatment of, 279
vagina in, 279
protraction of, 66
pruritus in, 282
pseudo-menstruation in, 335
quickening in, 59
relapsing fever in, 301
renal diseases in, see Albuminuria
respiratory system in, 56
troubles in, 287
retroflexion in, 278
retroversion in, 273
rubeola in, 301
salivation in, 57, 286
scarlatina in, 546
sebaceous glands in, 57
secondary abdominal, see Ectopic Gestation
signs of, 60
size of uterus in, 39, 66
skin in, 57
smallpox in, 300
spleen in, 56
spurious, 71
striæ, abdominal, in, 51, 69
mammary in, 52
suppression of menses in, 58
symptoms of, 58
syphilis in, 302
thorax, changes in, in, 57
thyroid gland in, 56
tubal, see Ectopic Gestation
tubo-abdominal, see Ectopic Gestation
tubo-ovarian, see Ectopic Gestation
tumours, ovarian, in, 291
uterine, in, 288
typhoid fever in, 300
typhus in, 301
umbilical souffle in, 63
urine in, 57
sugar in, 57
uterine bruit in, 61
palpable, in, 61
uterine contractions in, 38
vaccination in, 301
vagina in, 46
vaginal examination in, 63
varicose veins in, 283
variola in, 300
vital capacity in, 57
vomiting in, 55, 59
pernicious, 284
vulva in, 46
Premature expulsion of ovum, 303
fœtal respirations, 178
labour, 303
artificial induction of, 362
breech presentations in, 168
in contracted pelvis, 439
in eclampsia, 512
in hydramnios, 259
in pernicious anæmia, 283
in placenta prævia, 346
in twins, 74
methods of inducing, 362
Premonitory signs of labour, 109
Preparations for labour, 180
Presentation, anterior parietal, 134, 433
of arm, 472
breech, see Breech Presentations
of brow, see Brow Presentations
compound, 476
in contracted pelvis, 427
definition of, 33
diagnosis of, see various presentations
of face, see Face Presentations
footling, 168
of funis, see Cord, Umbilical, Presentation of
of knee, 168
occipito-anterior, 132
occipito-posterior, 143
pelvic, see Breech Presentations
posterior parietal, 436
sacro-posterior, 174, 175
of shoulder, diagnosis in, 471
version in, 473
transverse, see Transverse Lie
in twin labour, 203
of vertex, see Vertex Presentations
Pressure, abdominal, use of, in breech cases, 200
on aorta in post-partum hæmorrhage, 485
arterial, in eclampsia, 510
puerperium, 220
of body-weight in development of pelvis, 421
on cord, avoidance of, see Breech Presentations
direct uterine, 103
in breech cases, 200
external, on uterus in hæmorrhage, 482
fœtal axis, 103
general intra-uterine, 102
intra-uterine during pains, 102
marks on fœtal head in pelvic contraction, 431
Primigravida, 109
Primiparæ, length of labour in, 127
in elderly, 127
Primiparity, 109
diagnosis of, 67
Procidentia uteri in pregnancy, 278
Projections, bony, in pelvis, 454
Prolapse of amnion, 114
anterior lip of cervix in labour, 115, 190
anterior vaginal wall, 457
arm in transverse lies, 472
cord, see Cord, Umbilical
intestines, see Rupture of Uterus
fœtal, see Ectopia Viscerum
membranes, 115
placenta, 344, 491
posterior vaginal wall, 458
pregnant uterus, 278
Prolonged labour, 407
definition of, 407
effects of, 408
exhaustion of uterus in, 408
varieties of, 407
Promontory of sacrum, 81, 83
displacement of, in contracted pelvis, 425, 426
false, 418
curve of, 432
Prophylaxis, see Puerperal Septicæmia
Proportion of sexes at birth, 32
Proteids in milk, 218
Protracted labour, 407

Protracted labour, causes of, 407
in first stage, 408
in second stage, 408
pregnancy, 66
Pruritus in pregnancy, 282
Pseudo-malacosteon pelvis, 451
Pseudocyesis, 71
Psoas muscles, 86
Psychical condition of child at birth, 239
Psychical condition of mother during pregnancy, 54
Ptyalin in new-born child, see Salivary Glands, 238
Ptyalism in pregnancy, 57, 286
Pubic bones, 83
Puerperal eclampsia, 509
endocarditis, 540
fevers (and see special headings, Septicæmia, Scarlatina, &c.), 525
infection, conveyance of, 180
prevention of, 180
insanity, 556
involution, 213
mania, 556
melancholia, 556
osteophytes, 57
septicæmia, 525
state, 207
abdomen during, 222
after-pains in, 231
anteflexion in, 208
antiseptics in, 226
arterial tension in, 220
binder in, 229
bowels in, 230
breasts in, 231
cardiac sounds, 219
cervix during, 214
chill in, 526
clinical phenomena of, 208
collapse during, see Placenta Prævia and Sudden Death, 502
constipation in, 230
contracted pelvis, effect of, on, 432
diagnosis of, 223
diet during, 230
douching in, 226
dysuria in, 230
general functions in, 219
laxatives in, 230
lochia in, 2
management of, 225
micturition in, 230
milk, secretion of, in, 231
nursing in, 231
pathology of, 524
perinæum in, 215
pulse in, 230
rashes in, 568
relation to pathological conditions, 207, 524
respiration during, 220
retention of urine in, 230, 567
scarlatina in, 544
secretion of milk in, 231
septicæmia in, 525
skin in, 219
sleep in, 229
sudden death in, 502
temperature in, 220
tetanus in, 309, 564
tetany in, 565
thrombosis in, 548
treatment of, 225
urine in, 222
Puerperal state, uterus in, 208
vagina in, 212, 215
visits in, 225
vulva in, 212
washing of vulva in, 228
wounds in, 207
Pulmonary arteries, embolism of, 551
from iron injections, 483
thrombosis of, 550
disease during labour, 504
pregnancy, 297
vesicles, rupture of, in labour, 502
Pulse, fœtal, 62
effect of pains on, 106
maternal, in albuminuria, 507
eclampsia, 510
embolism and thrombosis, 551
hæmorrhage, 481
labour, 106
protracted, 408
puerperal state, 220
rate of, 220
tension of, 220
rupture of uterus, 491
septicæmia, 528, 530
Puncture of bladder in retention of urine, see Retroversion of gravid uterus
Puncture of fœtal sac in ectopic gestation, 330
hydrocephalic skull, 464
membranes in accidental hæmorrhage, 339
Puncture of membranes in induction of premature labour, 363
in placenta prævia, 347
in œdema of vulva, 459
of ovarian tumour, 292
Pupils in asphyxia neonatorum, 520
Purgatives in eclampsia, 513
puerperal septicæmia, 531
Purpura leading to sub-placental hæmorrhage, 337
Putrefaction, intra-uterine, of fœtus, 270
retained portions of placenta, 526
Putrefactive organisms in disease, 527
Putrid intoxication, see Sapræmia
Pyæmia, 540
Pyosalpinx after delivery, 535, 537
Pyrexia causing death of fœtus, 269

QUADRUPLETS, 72
Quickening, 59
date of, 59
fallacies of, 60
in pseudo-cyesis, 71

RACHITIC pelvis, 424, 426, 451. See also Rickets
Raised pelvis position, 493
Ramsbotham's sharp hook, 393
Rashes in puerperal state, 568
Rectal examination in ectopic gestation, 325
feeding in pernicious vomiting, 285
Recti, diastema of, 216, 272
Rectification, spontaneous, 468
Rectocele in labour, 458
Recto-vaginal fistula, 430
septum, rupture of, 497
Rectum, condition of, in pregnancy, 50
during labour, 118
loaded, causing inertia, 411
Reduction of inverted uterus, 488
mento-posterior positions, 158, 160
occipito-posterior positions, 143

Reduction of prolapsed cord, 516
uterus, 279
Reflex activity in new-born child, 239
stimulation of uterus, 485
Reflexa decidua, 6
atrophy of, 7
in multiple pregnancy, 73
Regeneration of endometrium after labour, 215
Relapsing fever in pregnancy, 301
as cause of abortion, 301
Relaxation of uterus, 97
Removal of placenta from uterus, 479, 480
uterus for cancer, 290
in Porro's operation, 401
Renal disease, see Albuminuria, 504
veins in albuminuria, 506
Reniform pelvis, 426
Rennet, action of, on milk, 242
Reposition of inverted uterus, 488
prolapsed cord, 516
prolapsed uterus, 279
retroverted gravid uterus, 276
Repositor, catheter as, 517
Murphy's, 517
Roberton's, 517
Reserve blood, importance to fœtus, 193
Respiration, artificial, in asphyxia neonatorum, 520
during pregnancy, 56
first of new-born, 236
in puerperal state, 220
Respiratory centre, injury to, causing asphyxia, 519
disorders in pregnancy, 287, 297
movements, premature, 178
Responsibility of parturient woman, 107, 558
Rest after labour, 229
Restitution in face presentations, 160, 161
in vertex presentations, 138
of form of head, 239
Resuscitation of child, 520
Retained placenta, 478
Retention of chorion, 114, 125
dead fœtus in utero, 269
dead ovum, 269
douche solution, 227
membranes in abortion, 308, 312
after delivery, 526
placenta after abortion, 308, 312
urine after delivery, 230, 567
in incarceration of uterus, 275
in labour, 460
during pregnancy, 275
during puerperium, 230, 567
Retinal affections in albuminuria, 507
Retraction of lower segment after delivery, 211, 214
Retraction during labour, 97
effect of, on uterus, 98
of uterus, definition of, 97
after delivery, 208
-ring, 98, 209
'Retroceps,' value of instrument, 371
term, 371
Retroflexion of fœtus, 264
gravid uterus, 278
Retroversion of gravid uterus, 273
abortion in, 274
Retroversion of gravid uterus, abortion, induction of, in, 277
Retroversion of gravid uterus, anatomy of, 273
bladder in, 274
causes of, 273
causing ystitis, 275
diagnosis of, 275
incarceration of, 273
Retroversion of gravid uterus, œdema of fundus in, 274
replacement of, 276
retention of urine in, 274
spontaneous recovery of, 274
symptoms of, 274
treatment of, 276
urethra in, 274
uterus after delivery, 576
Rhythm of uterine contractions, 96
Rickets, contracted pelvic from, 424, 426, 443, 447, 451
external appearances of, suggesting contracted pelvis, 415
fœtal, 266
intra-uterine, 266
Ricketty pelvis, flat, 424
generally contracted flat, 426
kyphotic, 447
scoliotic, 443
tri-radiate (pseudo-malacosteon), 451
Rigidity of cervix, 456
hymen, 459
os, 456
perinæum, 459
Rigor in labour, 107
septicæmia, 528, 530
Ring of Bandl, 98, 118
retraction-, 98
Robert's pelvis, 448
Roederer's obliquity, 133
Rokitansky, osteophytes of, 57
Rotation of fœtal head in brow cases, 166
external, 138
in face cases, 158
in flat pelvis, 432, 436
in forceps, 385
internal, 135
causes of, 135
in small round pelvis, 436
in vertex presentation, 135, 138
fœtus in breech presentations, 171
for dorsal displacement of arm, 475
shoulders, 138
Round ligaments in labour, 100
in pregnancy, 48
Rubeola, see Measles
Rudimentary uterine horn, pregnancy in, 322
Rupture of air-vesicles in labour, 502
cervix, 494
chorion alone, 114
cord, 517
fourchette, 191
hydrocephalic skull, 464
hymen during labour, 67, 212
ilio-sacral synchondrosis, 501
membranes, 113
in accidental hæmorrhage, 339
artificial, in normal labour, 189
delayed, 114, 125
in induction of labour, 364
modes of, natural, 113
in placenta prævia, 347
premature, 113, 114, 124
spontaneous, 113
pelvic joints, 501
perinæum, 496
causes of, 496

Rupture of perinæum, complete, 497
incomplete, 497
methods of, 497
prevention of, 191, 407
in precipitate labour, 406
results of, 498
treatment, 498
varieties of, 496
of sac of ectopic gestation, 317
ovarian tumour in labour, 461
sphincter ani, 497, 498
symphysis pubis, 501
umbilical cord, 517
uterine body, causes of, 489
complete, 491
diagnosis of, 492
drainage after, 493
frequency of, 489
incomplete, 491
morbid anatomy of, 491
in pelvic contraction, 489
with pendulous belly, 490
prophylaxis of, 492
signs and symptoms of, 491
treatment of, 492
treatment of, by abdominal section, 399, 493
treatment of, summary of, 494
varieties of, 491
with vesicular mole, 255
vagina, 495
causes of, 494
diagnosis of, 495
treatment of, 495
vestibule, 501

Sac, ectopic gestation, aspiration of, 330
calcification of, 320
electro-puncture of, 330
injections into, 330
rupture of, 315, 320
suppuration of, 320
Sacciform dilatation of lower uterine segment, 278
Sacral promontory, 81, 83
Sacro-cotyloid diameter in Nägele pelvis, 446
in occipito-posterior positions, 145
Sacro-iliac articulation, 49
rupture of, 501
Sacro-posterior presentations, 174, 175
Sacrum, anatomy of, 82
asymmetry in Nägele pelvis, 445
atrophy in ditto, 445
development of, 421
effect of, in development of pelvis, 421
in flat pelvis, 425
in generally contracted flat pelvis, 426, 427
in infantile pelvis, 425
in kyphotic pelvis, 448
in malacosteon, 449
promontory of, 81, 83
in Robert's pelvis, 448
in skoliotic pelvis, 444
in spondylolisthetis, 453
swinging movement of, 86, and Appendix
Sagittal suture, 92
in Nägele obliquity, 135, 433
in posterior parietal obliquity, 436
Sagittal suture in vertex presentations, 134. See also Special Mechanisms
St. Vitus' dance, see Chorea
Saline intravenous infusion, 360
Saliva in new-born child, 238
Salivation in pregnancy, 57, 286
Salpingitis, 309, 534
Sänger's method of Cæsarian section, 399
Sanitary arrangements of lying-in room, 180
Sapræmia, 526, 527
symptoms of, 528
Sarcoma of uterus, 577
Scalp, fœtal, œdema, and tumours of, see Caput
Scarlatina in new-born child, 547
in pregnancy 546
in puerperal state, 544
relation of, to puerperal septicæmia, 544
symptoms of, 546
Schatz on treatment of face presentations, 198
Schultze on artificial respiration, 521
delivery of placenta, 122
Scissors in decapitation, 393
Sclerema neonatorum, 583
Scoliosis in pelvic contraction, 443
Scoliotic pelvis, 443
Sebaceous glands of areola, 53
of skin in pregnancy, 58
Secale cornutum, see Ergot
Secondary areola, 54
hæmorrhage, 486, 576
uterine inertia, see Exhaustion, 412
Secretion in axillary lumps, 58
lochial, see Lochia
Section, abdominal, see Cæsarian Section and Ectopic Gestation
Section of cervix in carcinoma, 457
Sedatives in abortion, 310
eclampsia, 513
insanity, 561
Segment, lower uterine, 98
after delivery, 209
laxity of, as (Hegar's) sign of pregnancy, 64
rupture of, 490
upper uterine, 98
Segmentation of velk, 7
Semen, vitality of, in uterus and tubes, 65
Semmelweis on puerperal septicæmia, 181
Sensations in new-born child, 239
Separation of child, 193
of membranes, 121, 124
of placenta, 121
modes of, 121
Sepsis, see Septicæmia
Septicæmia, abscesses in, see Pyæmia, 540
after abortion, 309
antiseptics in prevention of, 181, 226
bacilli in, 527
causation of, 526
cellulitis in, 532
diphtheritic patches in, 548
douching in, 528, 530
endometritis in, 534
exploration of uterus in, 531
lochia in, 528, 530
micro-organisms in, 527
mild cases of, 527
milk in, 529
mortality from, 182
in new-born child, 584
parametritis in, 531, 532
perimetritis in, 531, 534
peritonitis, general, in, 538
phlebitis in, 533
prophylaxis of, 181, 183, 226
puerperal, 527

Septicæmia, pyæmia in, 540
rashes in, 528, 530
relation to scarlatina, 544
Semmelweis on, 181
severe cases of, 529
symptoms of, 528
temperature charts in, 528, 529
treatment of, 530
typhoid state in, 530
varieties, 527
venous, 533
Septic infection, conveyance of, 526
of new-born child, 584
prevention of, 181, 183, 226
intoxication, 526, 527
results of, 527
sewer gas in, 526
virus distinguished from putrefactive, 527
Septum, recto-vaginal, injury to, 497
Sero-sanguineous swelling after delivery, 581, see also Caput
Serotina, 6
Serous discharge from uterus in pregnancy, 247
Sewer gas in puerperium, 526
Sex of child, diagnosis of, before birth, 62
importance, in induction of labour, 440
of fœtus, date of distinction, 30
of twins, 74
Sexes, proportion of, at birth, 32
Shape of fœtal head after labour, see Moulding
of pelvis, development of, 421
of uterus after delivery, 224
during pains, 111
in pregnancy, 36
Sheath of umbilical cord, 21
Shield for nipples, 570, 571
Shivering in labour, 107
in septicæmia, 528, 530
Shock, electric, in ectopic gestation, 330
in inversion of uterus, 487
rupture of uterus, 491
Short forceps, 372, 386
Shortening of cervix, apparent, in pregnancy, 45
in labour, 110
Shortness of cord, 478
Shoulder presentation, see Transverse Lie, 466
causes of, 466
diagnosis of, 471
natural terminations of, 467
treatment of, 473
Shoulders, breadth in anencephalus, 263
causing dystocia, 462
delivery of, in head presentation, 119, 139, 193
delivery of, in head presentation, delay in, 193
rotation of, 138
'Show' in labour, 110, 111
Sickness, morning, excessive, see Vomiting
Siège décompléte, 474
Sigault on symphysiotomy, 402
Silver nitrate for eyes of new-born, 240
Silvester artificial respiration, 520
Sinus, marginal, of placenta, 17
placental, 11
Sinuses, uterine, after labour, 214
proliferation of endothelium of, 43
thrombosis of, 43, 214
Site, placental, after labour, 209
normal, 15
in puerperium, 212
in third stage, 121
Sitting, effect of, on development of pelvis, 423
Size of fœtus in diagnosis of date of pregnancy, 66
uterus after labour, 208
Size of uterus in nullipara and multipara, 67, 224
pregnancy, 36
puerperium, 213
Skin, diseases of, in pregnancy, 282
effect of pregnancy on, 51, 57
pigmentation of, in pregnancy, 57
in puerperium, 219
striæ of, 51
of fœtus, 238
rashes on, 583
syphilitic affections of, 585
yellow staining of, 238
Skoliosis with pelvic contraction, 443
Skoliotic pelvis, 443
Skull, fœtal, diameters of, 93
fontanelles of, 92
fractures of, due to contracted pelvis, 431
hardness of, according to age of mother, 440
hydrocephalic, 463
injuries to, in contracted pelvis, 431
moulding of, 92, 144
relation to pelvis, see Various Mechanisms
Sleep after labour, 229
in exhaustion of uterus, 412
Sleeplessness in puerperium, 559
Sloughing of cord in separation, 239
after injury to parturient canal, 429
in inverted uterus, 488
Small-pox in fœtus, 301
in pregnancy, 300
in puerperal state, 548
vaccination in, 301
Small round pelvis (generally contracted pelvis), 425. See Generally Contracted Pelvis
Smellie on curves of forceps, 372
Softening of bones in osteo-malacia, 299, 449
cervix, 46
joints in pregnancy, 48
Solayres' obliquity of head, 130
Somatopleure, 8
Sore nipples, see Nipple
Souffle, funic, 63
so-called placental, 62
umbilical, 63
uterine, 61
Sound, uterine, in diagnosis of ectopic gestation, 325, 326
Sound for rupture of membranes, 339
Spasm of cervix, 88
of uterus, see Tetanus Uteri
Spasmodic rigidity of cervix, 88
Specific gravity of liquor amnii, 19
parts of fœtus leading to various lies, 34
Spencer on diagnosis of placenta prævia, 346
hæmorrhages in still-birth, 108
Spermatozoa, vitality of, in female passages, 65
Sphincter ani, in floor of pelvis, 87
rupture of, 497
Spina bifida, diagnosis of, ante-partum, 465
Spinal curvature in pelvic deformity, 443, 447
Spine, articulation of head with, 78
Spines, iliac, anterior, distance apart, 416
posterior superior, distance apart, 417
ischial, distance, 84
Spiral arteries of uterus, 15
turns of umbilical cord, 21
Spirilla in blood of fœtus, 301
Splanchnopleure, 8
Spleen during pregnancy, 56
syphilitic fœtal, 268
Split pelvis, 425
Spondylolisthesis, 452

Spondylolisthesis, causation of, 452
diagnosis of, 453
results of, 452
treatment of, 453
Spondylolysis, 452
Spondylotomy, 394
Sponge-tents in accidental hæmorrhage, 356
disinfection of, 357
for inducing labour, 365
in placenta prævia, 347, 348
Spontaneous evolution, 470
expulsion, 471
rectification, 468
version, 469
Sporadic cretinism, 266
Spot, germinal, 2
Spurious labour, 71
pains, 109
pregnancy, 71
Stages of labour, see Labour
Starch, digestion of, by new-born child, 242
State, puerperal, see Puerperal State
Steepness of symphysis in pelvimetry, 419
Stenosis of cervix, 456
vagina, 458
Sterilisation during Cæsarian section, 398
of instruments, 352
milk, 243
Sternomastoid, hæmatoma of, 581
spastic contraction of, 581
Stethoscope, see Auscultation
Still-birth, 518
causation of, 519
classification of, 519
treatment of, 520
Stimulants in insanity, 561
in septicæmia, 531
Stomatitis, aphthous, 583
Straits of pelvis, 82
Striæ of abdomen, 51, 69
new, 52
old, 52
of breasts, 52
histology of, 52
of thighs, 52
Styptics in post-partum hæmorrhage, 482
umbilical hæmorrhage, 584
Subinvolution after abortion, 309
diagnosis of, from pregnancy, 70
Submammary abscess, 573
Suboccipito-frontal diameter, 94
at vulva, 192
Subperitoneal emphysema of uterus, 555
hæmatoma, see Ectopic Gestation
operation for ectopic gestation, 333
Subperitoneo-pelvic form of ectopic gestation, 315, 318
Subplacental hæmatoma, 122
Succenturiate placenta, 23
Suckling, contraindications to, 231
effect on involution, 231
frequency of, 231
Sudden death in labour, 502
puerperium, 502
Suffocation, see Asphyxia
Sugar in milk, amount of, 242
liquor amnii, 257
preparation of milk, 243
urine in pregnancy, 298
puerperium, 298
Suicide in insanity see Insanity, 556
Superfecundation, 73
Superfœtation, 73, 76
Superinvolution, 224
Support of perinæum, 190
Suppuration, see Abscess
in breasts, 571, 572
dermoids, 461
ectopic gestation, 315, 320
Sutures in Cæsarian section, 398
in ruptured perinæum, 498
uterus, 400
of skull in diagnosis of positions, see Various Positions of Vertex
in hydrocephalus, 464
overlapping at, 92
Symphysiotomy, 402
conditions for which suggested, 402
definition, 402
effect of, in enlarging brim, 403
instruments, 403
mode of operating, 403
relation to other operations, 404
results, 404
Symphysis pubis, height of, 85
inclination of, in pelvimetry, 419
relaxation of, 86
rupture of, 501
section of, see Symphysiotomy
synovial cavity of, 86
Synchondrosis, see Articulations of Pelvis
Syncope, see Collapse
Syncytium, 577
Syphilis causing abortion, 304
death of fœtus, 269
detachment of epiphyses, 265
pemphigus, 269
peritonitis of fœtus, 268
contracted during pregnancy, 302
as contraindication to suckling, 232
effect of, on bone of fœtus, 265
liver of fœtus, 268
lungs of fœtus, 268
placenta, 262
serous membranes of fœtus, 268
skin of fœtus, 269
spleen of fœtus, 268
in father, 268
fœtal, 268
in mother, 268
in new-born child, 585
in nursing woman, 232
in pregnancy, 302
transmission to fœtus, 268
treatment during pregnancy, 303
Syphilitic condylomata in child, 269
epiphysitis, 265
osteophytes, 266
Syringing, see Douche

Tampon, see Plug
Tannin in relaxation of anterior vagin wall, 279
sore nipples, 571
Tapping of ovarian cysts, 292, 461
of uterus in incarceration, 277
Tarnier, forceps of, 374
Taste, perversion of, in pregnancy, 55
Tears of parturient canal, see Ruptures and Lacerations
Teat, indiarubber, 570, 571
Temperature of douche in post-partum hæmorrhage, 482
of fœtus, 237
high, causing death of fœtus, 300
in labour, 107
in obstructed labour, 408
in puerperal septicæmia, 528, 530
in puerperal state, 220

Tents, disinfection of, 357
laminaria, 356
sponge, 356
tupelo, 356
use of, in abortion, 311
induction of labour, 365
placenta prævia, 347
Tetanic contraction of uterus, 409
Tetanilla, see Tetany
Tetanus after abortion, 309
delivery, 564
of new-born child, 580
uteri, 409
Tetany in pregnancy, 282
in puerperium, 565
during suckling, 565
Thorax, emphysema of, 502
after labour, 216
in pregnancy, 57
Thrill, uterine, 61
Thrombosis, cardiac, 550
of femoral veins, 548
symptoms of, 549
after injection of iron salt, 483
of pelvic veins, 548
of placenta, 26
in puerperal septicæmia, 548
of pulmonary arteries, 550
of uterine sinuses, 43
of veins of arm, 550
venous, 548
of villous arteries, 26
Thrombus, detachment of, 550, 554
of pulmonary artery, 550
vagina, 283
causes, 283
frequency, Appendix
treatment, Appendix
Thrush, 583
Thyroid, enlargement of, see Goitre
in pregnancy, 56
Tonic contraction of uterus, 409
Torsion of cord, 21, 30
excessive, 262
Torticollis, 581
Trachea, catheterisation of, 520, 523
Tract, genital, anatomy of, see various headings
Traction, axis, see Axis Traction
on cord, causing inversion, 487
direction of, in forceps extraction, 381
on jaw, in delivery of after-coming head, 201
Transfusion of blood, 360
of saline solutions after hæmorrhage, 340
method of, 360
Transverse diameter of brim, 83
cavity, 84
outlet, 84
lie of fœtus, 466
causation of, 466
decapitation in, 393, 473
diagnosis of, 471
embryotomy in, 393, 473
natural course of labour in, 467
in pelvic contraction, 427
rectification of, 473
spontaneous delivery in, 468, 469, 470, 471
treatment of, 473
version in, 473
Transversely contracted pelves, 447
Transversus perinæi, 87
Triplets, 72
frequency of, 72
Triradiate pelvis, 449
Triradiate rachitic pelvis, 451
Trismus uteri, see Spasm of Cervix, 188
Trochanters, distance between, 85
Trophoblast, 14
Trousseau on tetany, 565
Trunk, delivery of, in cephalic lies, 139
podalic lies, 171
lateral flexion of, in head presentations, 139
Tubal pregnancy, see Ectopic Gestation
Tube, Fallopian, in Cæsarian section, 398
position of, after labour, 212
in pregnancy, 47
Tuberosities, ischial, distance apart, 417
parietal, distance apart, 94
Tubo-abdominal pregnancy, 315, 318
Tumours complicating pregnancy, 288, 290, 291
diagnosis of, from pregnancy, 70
fibroid, see Fibroid
of fœtus, 465
obstructing delivery, 465
ovarian, see Ovarian Tumours
parametritic, see Parametritis
phantom, 70
of scalp, see Caput Succedaneum and Cephalhæmatoma
of uterus, 288, 455
Tunica fibrosa, 2
granulosa, 2
vaginalis ovarii, 322
vasculosa, 2
Tupelo tents, 356
Turning, see Version
Twin labours, 203
Twins, 72
causing transverse lies, 467
conjoined, 465
course of labour with, 203
decapitation in, 477
delay between births of, 204
delivery of, 203
development of, from ovum, 73
diagnosis of, 75
different fates of, 74
in double uterus, 75
early expulsion of one of, 74, 75
expulsion of placenta of, 203
flattening of one of, 74
inertia, due to, 203
interlocking of, 476
labour with, 203
ligature of cord in, 204
management of, 204
placentæ of, 203
post-partum hæmorrhage with, 204
premature delivery in, 74
presentations of, 203
in producing post-partum hæmorrhage, 204
prognosis of labour with, 203
sexes of, 74
superfecundation in case of, 73
superfœtation in case of, 73, 76
unequal development of, 74
Twisting of cord, excessive, see Torsion
round fœtus, see Coiling
of pedicle of ovarian cyst, 292
Tympanites uteri, 502
Typhoid fever in pregnancy, 300
puerperium, 548
Typhus fever in pregnancy, 301
puerperium, 548

Ulcer of nipple, 570
'puerperal,' 530, 548
Umbilical arteries, 21

Umbilical arteries, dilatation of, 25
hæmorrhage from, after birth, 584
hæmorrhage from, treatment of, 585
bruit, 63
cord, see Cord, Umbilical
duct, 9, 10
hernia of fœtus, 265
souffle, 63
vein, 21
vesicle, 9
on placenta at term, 16
vessels, 9
hæmorrhage from, 574
occlusion of, 237
Umbilicus, care of, in new-born, 240
hæmorrhage from, 585
hernia of, 585
infection at, 584
Unavoidable hæmorrhage, see Placenta Prævia
Uncontrollable vomiting, see Vomiting
Urachus, patent, 584
Uræmia, 509
Urates in urine of lying-in woman, 222
Urea administered to dogs, 510
in eclampsia, 511
liquor amnii, 19
Ureters during pregnancy, 50
supposed compression of, by uterus, 505
Urethra, affections of, after labour, 567
injuries to, 501
after labour, 213, 567
during labour, 118
laceration of, 501
Uric acid infarcts in new-born, 237
Urinary system in puerperium, 222
Urine, acetone in, 223
albumin in, see Albuminuria
chlorides in, 222
difficulty of passing, in puerperal state, 222, 567
during eclampsia, 507, 508, 511
fœtal, characters of, 237
chloroform in, 206
incontinence of, due to fistula, 567
retention, 222, 567
of new-born child, 207
peptones in, 223
during pregnancy, 57
in puerperal state, 222
during recovery from eclampsia, 511
retention of, in labour, 460
during pregnancy, due to incarceration, 274
during puerperium, 222, 567
secretion of, in puerperium, 222
specific gravity of, 222
sugar in, 57, 222
urates in, in puerperium, 222
Uterine action, 96
abnormal, 406, 411
after delivery, 208
atony, 411
bruit, 61
cause of, 61
palpable, 61
in puerperium, 220
contractions, see Contraction, Uterine
douche, 227
endometrium, changes in, in pregnancy, 4
puerperium, 215
inflammation of, 247, 534, and see Endometritis
pigmentation of, 215
glands, regeneration of, after labour, 215
Uterine hæmorrhage, see Hæmorrhage, Uterine
inertia, see Inertia
muscle, changes in, during pregnancy, 41
puerperium, 214
segment, lower, 42, 209
sinuses, see Sinuses
souffle, 61
tumours, 288, 455
Uterus, abnormalities of, 75, 294, 459
action of, in labour, 96
pain on walls of, 102
adhesion of placenta to, 479
air in, 502
anteflexion of gravid, see Anteflexion
normal, of, during pregnancy, 39
anteversion of, see Anteversion
arcuatus, 293
causing face and brow presentations, 293
arteries of, 15
changes in, after labour, 214
changes in, during pregnancy, 42
proliferation of endothelium of, 43
atony of, see Inertia
atresia of, 455
bicornutus, 294
bimanual compression of, 484
body of, 42, 98
bruit of, 61
cancer of, see Cancer of Uterus
capacity of gravid, 36
cervix of, see Cervix
changes in position in pregnancy, 39
shape in pregnancy, 36
size in pregnancy, 36
complete rupture of, 491
condition of, after delivery, 208, 210
connective tissue of, 41
continuous action of, see Tetanus Uteri
contractions of, see Contractions, Uterine
cordatus, 293
'deciduoma malignum' in, 577
decrease in size after labour, 209
descent of, after delivery, 209
detachment of placenta from, artificial, 479, 480
detachment of placenta from, normal mode of, 124
deviation of axis, 41
dextro-rotation of, 41
didelphys, 294
dimensions of gravid, 36
displacements of gravid, 271
in contracted pelvis, 427
double, 75, 294, 459
relation of, to superfœtation, 76
twins in, 75
in ectopic gestation, 323
elasticity of, 100
evacuation of, in abortion, 312
carneous mole, 252
vesicular mole, 256
exhaustion of, 412
contrasted with tetanus uteri, 413
treatment, 412
exploration of, after labour, 196
extirpation of, for cancer, 290
fibroid of, see Fibroid
fundus of, see Fundus Uteri
glands of, 6
regeneration of, after labour, 215

Uterus, gravid, displacements of, 271
incarceration of, 273
hæmorrhage from, see Hæmorrhage
height above pubes in pregnancy, 39
puerperium, 208
stages of labour, 119
hernia of gravid, 280
hour-glass contraction of, 479
incarcerated, 273
in contracted pelvis, 428
inclination of, to right, 41
incomplete rupture of, 491
increased mobility in contracted pelvis, 427
increase in size of, in pregnancy, 36
inertia of, see Inertia
inflammation of, 532
injections into, 227
causing sudden death, 227
to induce labour, 363
in post-partum hæmorrhage, 482
in septicæmia, 531
injury to, 489
internal surface of, in puerperium, 212
introduction of hand into, 196
inversion of, see Inversion
involution of, 213
after abortion, 309
irrigation of, 227, and see Injections into Uterus
isthmus of, 42
lacerations of, 489
lateral deviation of, 41
length of, after delivery, 208, 213
ligaments of, in labour, 100
in pregnancy, 47
post-partum, 213
lower segment of, 42
after delivery, 209
bulging of anterior wall of, 454
lymphatics of, 44
malformation of, 293, 459
management of, in third stage, 195
measurements of gravid, 36, 66
post-partum, 208
mucous membrane of, after labour, 212
in puerperium, 215
muscle of, changes in, during pregnancy, 41
during puerperium, 214
muscular layers of, 41
myoma of, see Fibroid
nerves of, in pregnancy, 44
nipping of, in labour, 428
nulliparous, 225
obliquity of, 41
causing face presentations, 154
flexion of head, 133
one-horned, 294
os of, see Os Uteri
over-retraction of, 409
effects on child, 430
parous, 224, 225
passive inversion of, 487
perforation of, from pressure, 273
pigment on inner surface of, 215
plugging of, for hæmorrhage, 483
polarity of, 99
polypus of, fibroid, 457
mucous, 288
placental, 308
position of, in different postures, 197
Uterus, posterior wall of, bulging of, 455
post-partum condition of, 208
pressure on, in hæmorrhage, 482, 484
prolapse of, in pregnancy, 278
in puerperium, 208
puncture of, 490
relaxation of, 97
removal of, 290, and see Porro's Operation
retraction of, 97, 208
excessive, in obstruction, 409
premature, 414
retroflexion and version, see Retroflexion and Retroversion
rupture of, see Rupture of Uterus
sarcoma of, 577
after second stage, 119
in septicæmia, 532
septus, 294
shape of, after delivery, 224
gravid, 36
affecting lie, 34
signs of delivery in, 224
sinking of gravid, 209, 213
sinuses of, 43, 214
after labour, 214
proliferation of endothelium of, 43
thrombosis of, 43, 214
size of gravid, at different months, 36
nulliparous, 36
souffle of, see Souffle
subinvolution of, after abortion, 309
subperitoneal emphysema of, 555
subseptus, 293
tenderness, post-partum, 208
tetanus of, 409
thickness of walls of, at term, 36
after third stage, 126, 127, 208
in third stage, 120
tonic contraction of, 409
tumours of, 283, 455
causing dystocia, 455
tympanites of, 502
unicornis, 294
veins of, 42
changes in, during pregnancy, 42
vessels of, 42
changes in, during pregnancy, 42
changes in, during puerperium, 214
walls of, after labour, 210
weight of, 36

Vaccination in pregnancy, 301
effect on fœtus, 301
Vagina after labour, 212
atresia of, 458
cancer of, in pregnancy, 291
changes in, after labour, 215
during pregnancy, 46
during puerperium, 215
colour of, in pregnancy, 46
contractions of, 100, 173
cystocele of, 457
cysts of, 458
disinfection of, during labour, 188
displacement of, in labour, 457
pregnancy, 279
double, 294
douching of, see Douche
duplex, 294
expulsive action of, 100, 173
fistula of, 429

Vagina, fornices of, 532
hæmatoma of, see Appendix
hæmorrhage from, in new-born children, 239
hæmorrhage from, at labour, 188
inflammation of, 'diphtheritic,' 548
injuries to, in labour, 494
involution of, 215
laceration of, 494
mucous membrane of, in pregnancy, 46
occlusion of, 458
operation in ectopic gestation through, 334
perforation of, 494
by fœtal head, 273
plugging of, 353
in abortion, 311
for placenta prævia, 348
post-partum condition of, 212
prolapse of anterior wall of, 457
during pregnancy, 279
purulent discharge from, during labour, 188
rupture of, 273
septa, 294
spasm of, 459
sphincter of, 87
stenosis of, 458
thrombus of, see Appendix
tubercle of, 47
ulcers on walls of, 548
veins of, in pregnancy, 47
Vaginal bleeding in new-born children, 239
douches, see Douches
examination in pregnancy, 63
labour, 186
growths, 458
incision in ectopic gestation, 334
muscles, 100
orifice, examination of, after delivery, 196
orifice, laceration of, 191
portion, see Portio Vaginalis
tampon in hæmorrhage, 353
Vaginismus, 359
Vaginitis, 'diphtheritic, 548
at labour, 188
Valve, Eustachian, of foramen ovale, 235
falciform, 15
of pelvis, 118
Valvular disease in labour, 503
pregnancy, 296, and see Heart
Varices, see Varicose Veins
Varicose veins of external organs, 283
hæmorrhage from, 283
of legs in pregnancy, 50, 283
in pregnancy, 47, 50, 283
diminution of, after labour, 220
of rectum, 50
Variola in fœtus, 301
pregnancy, 300
Vas aberrans in fœtal membranes, 24
Vectis, 386
in occipito-posterior positions, 386
Vein, coronary of placenta, 17
portal, 235
umbilical, 21, 235
Veins, entrance of air into, 555
of leg, thrombosis in, 548
pelvic, in pregnancy, 50
in puerperal septicæmia, 548
varicose, see Varicose Veins
Velamentous insertion, 28
dangers of, 28
Venesection, 513
in eclampsia, 513
Venosus ductus Arantii, 235
Venous thrombosis, see Veins
Vernix caseosa, 31
removal of, 240
Version in accidental hæmorrhage, 340
after craniotomy, 391
perforation, 391
before craniotomy, 392
bimanual, 367
bipolar, 367
Braxton Hicks on, 367
cephalic, 366
combined, 367
in contracted pelvis, 442
contraindications to, 370
external, 366
extraction after, 369
in face presentations, 199
internal, 368
methods of, 366
objects of, 365
in placenta prævia, 349
podalic, 366, 367, 368, 369
for prolapse of cord, 517
in shoulder presentation, 473
spontaneous, 469
in transverse lies, 473
Vertebræ in spondylolisthesis, 452
Vertebral column, see Spinal Column
hook after perforation, 391
Vertex, positions of, 130
foreign nomenclatures, 131
presentation, 128
caput in, 119
cause of, 34
diagnosis of, 141
frequency of, 129
mechanism of, 128, 141
moulding of head in, 140, 144
occipito-posterior positions of, 142, 143
unreduced, 144
prognosis of, 177
signs of, 141
Vesical calculus in labour, 460
fistula, 429, 567
Vesicle, germinal, 2
umbilical, 9
at term, 16
Vesico-vaginal fistula, causing incontinence of urine, 567
Vesicular mole, 252
Vessels, uterine, after labour, 214
Vestibule, tears in, after labour, 212
Villi, chorionic, 10
in carneous mole, 248, 250
degeneration of, 26, 248, 252, 256
development of, 10
structure of, 14
vascularisation of, 9
vessels of, 14
placental, 11
degeneration of, 261
Virgin, hymen of, 67
uterus of, 225
Viscerum ectopia, 264, 585
Vision in new-born child, 239
Vital capacity of lungs in pregnancy, 57
Vitelline duct, 9, 10
persistence of, 584
Volition in new-born child, 239
Vomiting of blood in new-born child due to cracked nipples, 233
caused by pains, 107

Vomiting in pregnancy, 55, 59
pernicious, 284
causes of, 284
relation to acute atrophy, 284
symptoms and course, 284
treatment, 285
in septic peritonitis, 538
as sign of pregnancy, 59
Vulva after labour, 212
changes in, in pregnancy, 47
dilation of, 117, 118, 119
disinfection of, in labour, 184
puerperium, 226
hæmatoma of, see Appendix
inspection of, after labour, 196
laceration of, 501
œdema of, in labour, 459
pregnancy, see Albuminuria
thrombus of, see Appendix
ulcers of, 548
varices of, 47

Walls, abdominal, see Abdominal Walls
of uterus, penetration of, by vesicular mole, 254, 256
Water bag of Champetier de Ribes, 359
hot, in post-partum hæmorrhage, 482
intravenous injection of, at term, 36
rectal injection of, 360
Waters, bag of, see Liquor Amnii
Weakness of pains, see Inertia
Weaning, see Lactation
Wedge action of head, 105
Weight of child at term, 30
variations in, 31
variations in, factors governing, 31
changes in, after birth, 238
Weight of child, after immediate ligature, 238
late ligature, 238
gain of, in new-born child, 238
loss of, by new-born child, 238
of body, causing deformity of pelvis, 425, 443
of body in development of pelvis, 421
osteo-malacia, 449
rickets, 424, 426
of fœtus at seventh month, 30
term, 30
unusual, 32
of gravid uterus, 36
of parous uterus, 225
of virgin uterus, 225
Wet-nurse, 241
feeding of, 241
selection of, 241
Wet-pack in eclampsia, 512
Wharton's jelly, 21
development of, see Changes in Ovum, 7
knots of, 28
torsion of, 28
Whey, 243
'White' asphyxia, 519, 523
Widening of pelvis in development, 421
by symphysiotomy, 403
Womb, see Uterus
Wounds of genitals in pregnancy, 335

Yellow atrophy of liver in pregnancy, 284, 286
Yelk sac, 9
at term, 16
segmentation of, 7

Zona pellucida, 2, 8
Zone of dangerous insertion, 342
Zymotic diseases in pregnancy, 299
relation of, to septicæmia,

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