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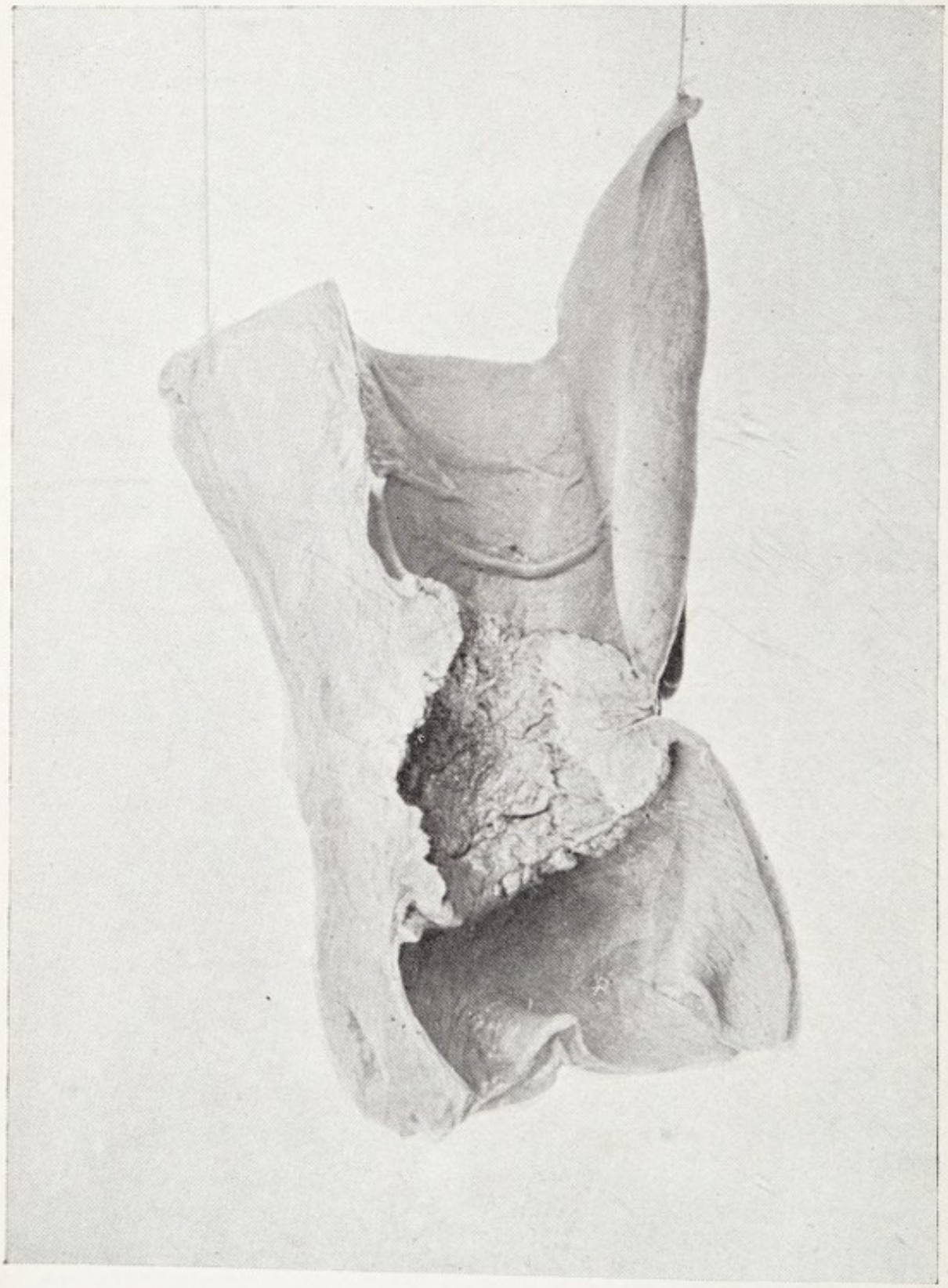
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THE SURGERY

OF

THE ALIMENTARY CANAL



CARCINOMA OF COLON

PRODUCING STRICTURE

Frontispiece, FIG. 51, *see page* 338

THE STUDENT'S HANDBOOK

OF

THE SURGERY

OF

THE ALIMENTARY CANAL

BEING AN ABRIDGED AND AMENDED EDITION
OF THE AUTHOR'S TREATISE ON
THE SAME SUBJECT

BY

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PREFACE.

The present work is an abridged and amended edition of my Treatise on the same subject published in 1896. So far as space would permit, and commensurate with the object in view of placing the material at my disposal in a form that would commend itself alike to the student and general practitioner, I have endeavoured to introduce such additional information on the subject as has been gleaned through personal experience during the last four years. The abridgment has been mainly effected by the elimination of detailed reports of illustrative cases and of many references, both of which, while they materially assist in elucidating and amplifying the text, tend to add very much to the bulk and expense of a book.

I cannot withhold repeating what was previously stated in the preface of my original work as an apology for the appearance of that book, and equally, therefore, as a reason for the issue of the present, that I believe very much is to be gained by the combined study of the whole alimentary tract. Such a study greatly facilitates the acquisition by the student of an adequate knowledge of all the diseases affecting the different regions of the canal; and the practitioner similarly benefits by gaining a clearer and more correct appreciation of the symptoms of the same diseases and their appropriate treatment.

In partial pursuance of these views an attempt has been

made to tabulate a scheme of operations upon the alimentary canal which shall possess a reasonable and workable basis for comparison. Throughout the book the various operations are described in accordance with this scheme, due regard, however, being had for such as are frequently understood in a practical sense different from that herein suggested. Many of the illustrations in the Treatise have been retained, while a few new ones have been added. Some of those retained are from the excellent photographs originally taken for me by Dr. Grant Andrew from pathological specimens in the Hunterian Museum, and in the Museums of the Royal, Western, and Victoria Infirmaries of Glasgow, known in the text by the letters R.I.M., W.I.M., and V.I.M. affixed.

In conclusion, I should state that the actual region of the alimentary canal treated extends from the upper end of the œsophagus to the lower end of the rectum proper; in other words, the diseases of the mouth, fauces and pharynx above, and those, such as hæmorrhoids, fistula-in-ano and fissure, of the anus proper below are not dealt with. The object of the work is solely to study those more hidden parts of the tract where similarity, either in pathology or in symptoms, is as likely to elucidate as it is to mislead in the differential diagnosis of disease and its appropriate treatment.

A. ERNEST MAYLARD.

GLASGOW, *March* 1*st*, 1900.

CONTENTS.

PART I.

ŒSOPHAGUS.

CHAP.		PAGE
I.	Surgical Anatomy and Physiology	3
II.	Injuries, Internal and External. Rupture	6
III.	Impacted Foreign Bodies	14
IV.	Inflammatory Affections	26
V.	Ulcer. Varicose Veins. Syphilis. Tuberculosis. Actinomycosis	32
VI.	Innocent Tumours	37
VII.	Malignant Tumours. Carcinoma	39
VIII.	Cicatricial Stricture	58
IX.	Paralysis and Spasm	70
X.	Abnormalities. Diverticulum	77
XI.	External Influences	89
XII.	Operations	92

PART II.

STOMACH.

XIII.	Surgical Anatomy and Physiology	103
XIV.	Method of examining Stomach	108

CHAP. PAGE

XV. Injuries 116

XVI. Foreign Bodies. Gastroliths. Hair Concretions . 121

XVII. Ulcer 127

XVIII. Tumours of Fundus 146

XIX. Obstruction of Pylorus and Cardiac Orifice . . 150

XX. Dilatation. External Influences 161

XXI. Operations 164

PART III.

SMALL AND LARGE INTESTINE.

SECTION I.

DUODENUM.

XXII. Anatomy. Injuries. Foreign Bodies 195

XXIII. Acute and Chronic Ulcer 199

XXIV. Tumours. Stricture. Diverticulum 207

XXV. Operations 213

SECTION II.

JEJUNUM AND ILEUM.

XXVI. Anatomy and Physiology 214

XXVII. Injuries: Rupture 218

XXVIII. Injuries (*continued*): Punctured and Incised Wounds . 227

XXIX. Injuries (*continued*): Gun- and Pistol-shot Wounds . 232

XXX. Foreign Bodies 239

XXXI. Tubercular and Typhoid Ulceration 245

XXXII. Obstruction: Internal Hernia. Bands. Diverticula 253

CHAP. PAGE

XXXIII. Obstruction (*continued*): Adhesions. Kinking . . 265

XXXIV. Obstruction (*continued*): Intussusception . . . 267

XXXV. Obstruction (*continued*): Volvulus. Stricture . . 281

XXXVI. Obstruction (*continued*): Gall Stones. Concretions 290

XXXVII. Obstruction (*continued*): Tumours of Bowel Wall 295

XXXVIII. Obstruction (*continued*): External Pressure. Peritonitis. Congenital Abnormalities. Neuroses 299

SECTION III.

LARGE INTESTINE AND APPENDIX.

XXXIX. Anatomy and Physiology 309

XL. Injuries. Inflammation. Ulceration. Actinomycosis 314

XLI. Cicatricial Stricture 320

XLII. Internal Strangulation. Adhesion and Kinking. Intussusception. Volvulus 324

XLIII. Gall Stones. Fæcal Accumulation 339

XLIV. Innocent and Malignant Tumours. Carcinoma . 335

XLV. Idiopathic Dilatation. Abnormalities . . . 348

XLVI. Embolism and Thrombosis of Mesenteric Vessels . 352

XLVII. Anatomy of Vermiform Appendix. Appendicitis . 354

XLVIII. Appendicitis: Symptoms and Diagnosis . . . 361

XLIX. Appendicitis (*continued*): Prognosis and Treatment . 367

L. Operations upon Small and Large Intestine . . 377

PART IV.

RECTUM.

LI. Anatomy and Physiology. Physical Examination . 411

LII. Injuries. Foreign Bodies 417

CHAP.		PAGE
LIII.	Inflammation	423
LIV.	Cicatricial Stricture	434
LV.	Tumours: Polypus	443
LVI.	Carcinoma	449
LVII.	Prolapse. Intussusception	467
LVIII.	Malformations. Congenital Stricture	475
LIX.	Neuroses. External Influences	485
LX.	Operations	487
LXI.	Rectal Administrations	498

LIST OF ILLUSTRATIONS.

ŒSOPHAGUS.

FIG.		PAGE
1.	*Half a crown impacted in Œsophagus*	17
2.	*Halfpenny impacted in Œsophagus*	19
3.	*Bristle Probang*	22
4.	*Coin Catcher*	23
5.	*Œsophageal Forceps*	24
6.	*Simple Perforating Ulcer of the Œsophagus*	33
7.	*Carcinoma of the Œsophagus*	41
8.	*Carcinoma of the Œsophagus*	49
9-11.	*Symond's Tubes for Carcinoma of Œsophagus*	53
12.	*Diverticulum of Œsophagus*	83

STOMACH.

13.	*Perforating Ulcer of Stomach*	133
14.	*Carcinoma of Stomach*	149
15.	*Carcinoma of Pylorus*	154
16, 17.	*Frank's Method of performing Gastrostomy*	169
18.	*Kader-Senn Method of performing Gastrostomy*	170
19-21.	*Witzel's Method of performing Gastrostomy*	172
22-26.	*Maylard's Method of clamping Intestine*	178

FIG. PAGE

27, 28. *Murphy's Button* 181

29-32. *Heineke-Mikulicz Operation of Pyloroplasty* 191

DUODENUM.

33. *Perforating Ulcer of Duodenum* 203

JEJUNUM AND ILEUM.

34. *Rupture of Jejunum* 223

35. *Pistol Shot-wound of Small Intestine* 235

36. *Tubercular Ulcer of Intestine* 246

37. *Typhoid Ulcer* 249

38. *Strangulation by Bands* 256

39. *Strangulation by Meckel's Diverticulum* 257

40. *Meckel's Diverticulum* 259

41. *Intussusception* 268

42. *Ileo-cæcal Intussusception* 270

43. *Ileo-cæcal Intussusception* 273

44. *Intussusception Sphacelus* 275

45. *Stricture of Small Intestine* 285

46, 47. *Portable Operating-table* 305

LARGE INTESTINE AND APPENDIX.

48. *Ileo-cæcal Valve*. 311

49. *Diaphragmatic Hernia* 325

50. *Carcinoma of Colon* 339

51. *Carcinoma of Colon* . . . . . *Frontispiece*

52. *Colloid Carcinoma of Sigmoid Flexure* 343

53. *Sarcoma of Large Intestine* 346

54. *Dilatation of Colon* 349

55. *Cystic Vermiform Appendix* 375

FIG. PAGE

56. *Maydl's Method of performing Jejunostomy* 382

57. *Albert's Method of performing Jejunostomy* 383

58-60. *Methods of Intestinal Anastomosis* 385

61-63. *Methods of Intestinal Suture. Lembert. Czerny* . . . 387

64, 65. *Abbé's Method of Suture* 388

66-69. *Maunsell's Method of Suture* 390

70-73. *Halsted's Method of Suture* 392

74. *Robson's Bone Bobbin* 393

75-77. *Murphy's Button for Anastomosis* 394

78. *Paul's Method of performing Colectomy* 400

79, 80. *Short-circuiting by Occlusion* 401

RECTUM.

81-83. *Rectal Bougies* 439

84. *Credé's Rectal Bougie* 441

85. *Colloid Carcinoma of Rectum* 451

86. *Mikulicz's Operation for Prolapse of Rectum* 473

87-96. *Malformations of Rectum and Anus* 476

97. *Kraske's Operation* 493

A TABLE OF THE MORE GENERAL OPERATIONS UPON THE ALIMENTARY CANAL.

Affix and Nature of Operation.	Œsophagus.	Stomach.	Small Intestine.	Duodenum.	Jejunum.	Ileum.	Large Intestine.	Cæcum.	Sigmoid.	Rectum.
—otomy. The opening and closing of a part at the same operation.	Œsophagotomy.	Gastrotomy.	Enterotomy.	Duodenotomy.	Jejunotomy.	Ileotomy.	Colotomy.	Cæcotomy.	Sigmoidotomy.	Proctotomy.
—ostomy.* The formation of a temporary or permanent opening of the nature of a fistula.	Œsophagostomy.	Gastrostomy.	Enterostomy.	Duodenostomy.	Jejunostomy.	Ileostomy.	Colostomy.	Cæcostomy.	Sigmoidostomy.	Proctostomy.
—ectomy. The excision of a part.	Œsophagectomy.	Gastrectomy. Pylorectomy.	Enterectomy.	Duodenectomy.	Jejunectomy.	Ileectomy.	Colectomy.	Cæcectomy.	Sigmoidectomy.	Proctectomy.
—orrhaphy. The lessening the capacity of a part by folding in and securing its parietes.	—	Gastrorrhaphy.	Enterorrhapy.	Duodenorrhaphy.	Jejunorrhaphy.	Ileorrhaphy.	Colorrhaphy.	—	Sigmoidorrhaphy	Proctorrhaphy.
—plasty. The division of a stricture in the long axis of the viscus, and union of the cut margins transversely.	—	Gastroplasty. Pyloroplasty.	Enteroplasty.	Duodenoplasty.	Jejunoplasty.	Ileoplasty.	Coloplasty.	—	Sigmoidoplasty.	Proctoplasty.
—pexy. The fixation of a displaced or dilated part in its normal position.	—	Gastropexy.	—	—	—	—	Colopexy.	—	Sigmoidopexy.	Proctopexy.

PART I.

THE ŒSOPHAGUS.

THE ŒSOPHAGUS.

CHAPTER I.

SURGICAL ANATOMY AND PHYSIOLOGY.

Surgical anatomy.—The relations of the œsophagus to surrounding parts are of considerable importance. Not only are important parts in immediate proximity to the canal liable to be affected by conditions of the œsophagus itself, but diseases arising from the surrounding parts are in their turn liable to produce complications of which the œsophageal troubles are only symptoms. But, apart from the consideration of disease, these same surrounding structures render operations upon the canal of special difficulty, or at least in need of more than usual care.

Course and extent.—The œsophagus extends from the cricoid cartilage above to about opposite the body of the tenth dorsal vertebra below; this lower point corresponding posteriorly with the apex of the ninth dorsal spine, and anteriorly with the junction of the seventh costal cartilage with the sternum on the left side. It is from nine to ten inches in length, and takes a somewhat sinuous course. At first situated in the median line, it deviates as it descends to the left side, so that at the root of the neck it has become deflected about half an inch. From this point it again passes to the middle line, reaching its original axis opposite the body of the fifth dorsal vertebra. It again deviates slightly to the left as it passes through its opening in the diaphragm. This latter point is approximately opposite the spine of the ninth dorsal vertebra. Besides a lateral deviation, the œsophagus is curved in an antero-posterior

direction. Following the course of the spinal column, it is first directed slightly forward by the convexity of the cervical curve; this, however, almost at once gives way to a concave curve as it sinks into the root of the neck and on into the thoracic dorsal curvature. This latter curve, according to Morell Mackenzie, disappears in the erect posture. As the tube enters the thorax at the root of the neck, its distance from the surface in the adult is from one and a half to two inches, the variation depending upon the shortness and fatness of the part. Before leaving the thorax it is directed somewhat forwards to enter its aperture in the diaphragm. On an average about half an inch intervenes between the diaphragm and its junction with the stomach.

Attachments.—The œsophagus, except towards its termination, is only loosely attached by connective tissue to the surrounding parts. The curves therefore easily straighten in the passage of stout bougies, and the tube is permitted to accommodate itself, in some degree, to pressure from without. The most fixed point is at the diaphragm.

Relations.—*Behind.*—The œsophagus is in close contact with the spinal column for most of its length. As it leaves the thorax the aorta intervenes.

In front.—It has first of all the trachea; lower in the neck, where it deviates to the left side, the thyroid gland and the thoracic duct. After entering the thorax it is crossed by the arch of the aorta and the left bronchus; for the rest of its extent it is covered by the pericardium. On each side in the neck it has the carotid artery, the left being in closer contact than the right. In the thorax the aorta, after crossing the œsophagus at its upper part, lies to the left, and the vena azygos major to the right. It is also covered laterally by the pleuræ. In the neck the recurrent laryngeal nerves ascend between it and the trachea; while in the thorax the pneumogastric nerves descend in close contact with it.

Calibre.—The œsophageal canal is the narrowest of any portion of the alimentary tract; and narrower in itself at the commencement opposite the cricoid cartilage and at the exit through the diaphragm. It is also constricted somewhat at the point where it is crossed by the left bronchus. Mouton, by obtaining a cast of the canal with plaster of Paris, found that at these three constricted parts

the internal diameter measured a little above half an inch, while at other parts it was about three-quarters of an inch. By forcible dilatation it was found possible to increase the diameter of the cricoid and bronchial constrictions to about three-quarters of an inch, the diaphragmatic to nearly an inch, and the other parts to about an inch and a half. It must, however, be remembered that these are post-mortem experiments and cannot well be accepted as examples of what amount of dilatation can take place during life. They are of value, however, in giving information regarding the relative diameter of different parts of the canal. Mackenzie, experimenting in the same way, showed that the antero-posterior diameter is considerably less than the transverse.

Structure.—The œsophagus resembles other portions of the alimentary tract in being composed of muscular, fibrous, and mucous coats. In comparison with other regions, its muscular coat is very thick; the fibrous coat is also thick, although loose in texture, and the mucous coat, lined with several layers of squamous epithelium, is similarly thick and firm. This last coat is thrown into numerous longitudinal folds when the canal is at rest—that is, when not distended. Numerous mucous glands exist in the submucous or fibrous layer. The arteries are disposed mostly longitudinally, and are more abundant at the upper than the lower part; hence the paler appearance of the canal below. The veins form plexuses in the submucous tissue and in the peri-œsophageal tissue. Numerous anastomoses are formed between these plexuses and the veins of the portal system and the vena cava. The lymphatics of the thoracic part pass into the posterior mediastinal glands, while those of the cervical portion go to the deep glands beside the carotid sheath. The nerve supply is through the pneumogastric.

Physiology.—The functions of the œsophagus are essentially those connected with the rapid transmission of the food from the pharynx to the stomach. The muscular coat is specially thick for this purpose, and the numerous glands admit of an abundant viscid secretion for lubrication. The constant friction to which the external surface is exposed is met by the extra thick layer of squamous epithelium. With regard to the rate of progress in the canal, Ogston found that the time required for the passage of food from the mouth to the stomach was about four seconds.

CHAPTER II.

INJURIES. INTERNAL AND EXTERNAL INJURY. RUPTURE.

Injuries to the œsophagus may arise from causes either inside or outside the canal. Those inflicted from within are the more frequent, and as a rule the less severe. On the other hand, in the case of external injuries, the depth of the gullet from the surface, and the important structures surrounding it, prevent generally any material damage to the former, without far more serious concomitant injury to the latter. Injuries inflicted therefore from without may be looked upon more as surgical curiosities, for either life has already become extinct before the surgeon sees the case, or the injury is so hopelessly irreparable as to be beyond treatment. Cases, however, are occasionally met with where surgical intervention has proved successful. These will be referred to later on.

Internal injuries.—These may be of the nature of incised, punctured, or lacerated wounds, and burns or scalds. Any part of the wall of the canal may be injured. The narrower parts opposite the cricoid cartilage and the diaphragm are those which most frequently suffer. The injury may be of any degree, from a single scratch or abrasion to a perforation. In the latter case neighbouring important structures may also be injured.

The agencies whereby these various wounds are produced are extremely numerous. Exclusive of such materials as cause burns or scalds, objects of all sizes and descriptions have been swallowed, intentionally or accidentally; swords, foils, and other sharp-edged weapons have been inserted for juggling or suicidal purposes. The nature of the wound produced will depend upon the shape and consistency of the body introduced. In the case of sharp-edged or sharp-pointed weapons the wound will be an incised or punctured one. In that of metallic substances, or irregular-shaped splinters of bone, broken bits of china, and other suchlike

hard brittle jagged bodies, the injury will be mostly of a lacerated character.

Symptoms.—These will depend upon the nature of the lesion. A mere abrasion or scratch will give rise to a feeling of soreness in the process of deglutition, and frequently create the impression that a foreign body has become impacted at the spot where pain is complained of. A deeper injury will cause some bleeding, and this may give rise to cough with bloody expectoration or vomiting of blood that has passed into the stomach. A punctured or perforating wound will give rise to symptoms depending mostly upon the organ or structure simultaneously injured. Thus involvement of a large blood vessel will produce rapid symptoms of hæmorrhage; an opening into the trachea or left bronchus, to cough and expectoration of blood, mucus, and food; perforation of the pleura or pericardium, to considerable collapse. To these immediate symptoms may be added great thirst, pain, and dysphagia. Later, symptoms will be mostly of an inflammatory character, due to the communication opened up between the œsophagus and the neighbouring parts Thus an abscess may form from simple penetration of the cellular tissue in the neck or mediastinum; pleurisy, empyema, and pneumothorax from opening of the pleural cavity; and similarly pericarditis from perforation of the pericardial cavity. Pneumonia may arise either as secondary to inflammation of the pleura or as a result of injury to the air passages themselves.

Diagnosis.—Internal injuries to the œsophagus will be, in the first place, mostly recognised by the previous history of the case; and the nature of the lesion will also often be arrived at by the kind of body producing it. In the second place, the symptoms associated with the act of deglutition, such as dysphagia, localised pain, and regurgitation or vomiting of blood will leave little doubt regarding the region injured.

Prognosis.—Judging from the way in which wounds produced by the surgeon heal, the œsophagus is in no way exceptional in its recuperative powers. Hence when the injury has not been of a grave nature and the exciting cause has been removed, a good result may be expected. Should, however, the lesion have been produced by a foreign body which has not passed on into the stomach, nor been

extracted, other results must be expected. These will be treated of later. In cases of severer injuries, where the immediate symptoms point to the involvement of other structures and parts, the prognosis will have to be a guarded one. If the case be not rapidly fatal, there are all the possible secondary complications arising from septic causes. The final issue of the case then turns upon these sequelæ and their treatment.

In the case of burns, the gravity of the immediate symptoms is not connected with injury to the œsophagus, but rather from affection of parts about the larynx and pharynx. Apart from a knowledge of the nature of the fluid or material swallowed, it may be fairly stated that as regards the œsophagus the prognosis is directly proportionate to the severity of the symptoms connected with the injury to the larynx and pharynx. If there is much mischief here, then it is only too likely that the œsophagus will have suffered badly; and if this be the case, sloughing or ulceration may result, with the subsequent formation of stricture.

Treatment.—The essential basis of all treatment is rest. The surface of the mucous membrane must be protected from friction, and the muscles must be prevented from action. This is best effected by giving no food by the mouth, but feeding the patient with nutrient enemata.* Thirst may be appeased by a little ice given by the mouth; and should much pain exist it must be allayed by anodynes given subcutaneously or per rectum. A week or two should be allowed to elapse before food is given by the mouth, and then fluids only should be first administered. Special symptoms arising later will call for treatment according to the complications they indicate.

In the case of injuries produced by swallowing concentrated acids or caustic alkaline solutions, resort should be had as soon as possible to the imbibition of fluids or other substances which might either neutralise the agent swallowed or dilute its concentration. Thus without discussing the treatment of those cases of poisoning which will be found more fully dealt with in books on general or forensic medicine, it may be briefly stated that the imme-

* See chapter lxi.

diate administration of large quantities of water and its rapid removal by the stomach pump will often prove the best means at hand to adopt.

External injuries.—Apart from operations on the œsophagus and its accidental injury in tracheotomy, injuries inflicted from without, and involving the gullet alone, are comparatively rare. Such, however, have occurred from bullets, sword, foil or dagger thrusts inflicted in war, or with homicidal intent. Far more common is it for such injuries to be associated with serious mischief to other and neighbouring parts.

The nature of the wound may be incised, punctured, or lacerated, and may pass simply into the canal or entirely through it. In cases of strangulation or garrotting the œsophagus may be contused.

Symptoms.—Many of these will be those already given in the case of internal injuries: there will be pain, dysphagia, and cough; possibly great thirst and troublesome hiccough, and symptoms arising from general disturbance. In addition there are those connected with the external wound, such as the escape of mucus or ingesta. To what extent these latter symptoms may manifest themselves will depend on the size and nature of the opening

Diagnosis.—Where the symptoms are marked, little difficulty will be experienced in deciding whether or not the gullet has been injured. Care must, however, be taken not to conclude that the escape of food from the wound is necessarily an indication of perforation of the gullet. A simple opening into the trachea may prove a source of exit for fluids which have trickled into the larynx from some defective action of the glottis. The direction of the wound and its depth will also assist in localising the injury. With regard to the nature of the wound, this may be approximately gathered from the character of the agent causing it.

Prognosis.—With the exception of uncomplicated incised wounds, all other injuries must be looked upon as of considerable gravity. A lacerated wound, such as that produced by a bullet, may lead on the one hand to a stricture, or on the other to a fistulous communication with the skin surface. Various septic conditions may arise of more or less serious character. In cases of severe hæmorrhage where death has not occurred immediately, the great loss of blood

may seriously affect the recuperative powers of the patient. In cases of almost complete severance of the canal and serious interference with its continuity, death may subsequently ensue from starvation, it being found impossible to supply sufficient nourishment. In cases of injury to the œsophagus in the thorax, the prognosis is necessarily bad. If not almost immediately fatal, there are all the secondary complications of the same nature as those already given in the case of internal injuries.

Treatment.—In treating wounds of the œsophagus inflicted from without, we have to devote as much attention to the patient generally as to the wound in particular. In other words we have to keep up the patient's strength without interfering deleteriously with the wound. As regards the wound, the first question which usually presents itself is whether an endeavour should or should not be made to close the opening in the œsophagus. This can only be answered by a careful consideration of the nature of the wound itself. In cases of clean cut, incised, or punctured wounds an endeavour may safely be made to completely occlude the aperture. This may be done either by a continuous or interrupted suture of sterilised silk or gut. And, further, where the wound is recent and it is believed that it is or can be rendered aseptic, the external wound may also be closed. In every case of doubt, however, on this latter point, and where also the closure of the œsophageal wound leaves doubt as to its efficiency, the external or surface wound should, if not left wholly open, be very thoroughly drained by tubes. Lacerated wounds of the gullet admit, as a rule, of but little treatment, and may even sometimes have to serve as apertures for the admission of a feeding tube. Cases of this kind are apt to leave troublesome external fistulæ, and treatment subsequently resolves itself into measures for the occlusion of these. For this purpose the usual means for such conditions may be adopted, as the cautery, caustic, &c.

In any kind of wound of the œsophagus, and especially if it be associated with wound of the trachea, the head should be secured by bandages to the trunk, so that as little movement as possible of the neck is permitted. Any complications which subsequently arise must be treated on general surgical principles.

As regards the patient, our chief consideration concerns the efficient administration of nourishment. Rectal alimentation should in all cases be adopted, and if this can be successfully carried on for over a week, the best opportunity is afforded for the wound to heal. Cases, however, will occur where such means of nutrition will prove inefficient and something must be conveyed to the stomach. The best method, if possible, is the natural one, the administration of nutrient fluids in teaspoonful doses by the mouth. If this cannot be done, then a stomach tube must be passed by the mouth if possible, or, if that be not possible, by the wound. The chief objection to the use of the tube is not only the injury it may inflict upon the wound in its passage, but the likelihood of its inducing retching or vomiting, results which would themselves act injuriously in unduly stretching the parts. It need hardly be said that in cases which have done well under rectal alimentation the return to feeding by the mouth should be both gradual and cautious. Bland unirritating nutrient fluids should be given first in small quantities—a teaspoonful at a time. Only after the lapse of a fortnight or three weeks should solid food be attempted, and even then only foods of a soft consistency and that have been well masticated. The sole endeavour being not to overdistend the wounded region, precautions should be taken accordingly. In cases of great thirst the fluid should be administered by enemata, and, if necessary, ice may be given to suck. Pain may be allayed by the usual anodyne measures.

Rupture of the œsophagus.—Judging from the comparatively few recorded cases rupture of the œsophagus must be a very rare accident, and still rarer are those cases in which the rupture has occurred in a practically healthy organ. Many of the earlier cases recorded are too doubtful to be accepted as illustrations of the accident, and many also recorded as ruptures are the result of post-mortem softening of the walls.

The cases usually met with may be divided into three classes:

1. Spontaneous rupture in a practically healthy canal.
2. Spontaneous rupture in a canal weakened either by ulceration or cicatrisation.

3. Spontaneous rupture in a canal which has undergone in parts gastric solution.

(1) In the first class—that of rupture of a healthy canal—the rupture can only occur as the result of some violent effort to expel an impacted body. The patient makes every possible effort to eject the body. The diaphragm is first fixed after an inspiration, and the lungs thus distended are made to endure an overstrain in an endeavour to hawk up the substance. As a result of this strain some rupture of the air-vesicles may take place with consequent emphysema. Rupture also of small blood-vessels may result, with expectoration of blood. Coupled with this is the intense anxiety of the patient, accompanied later with considerable exhaustion. Should the impacting body be expelled, as it may be by the final extraordinary effort which at the same time ruptures the œsophagus, it will be ejected with great force. The patient may at this moment become conscious of something having given way, and may or may not be attacked with sudden pain. The symptoms for some time will be those connected with the excessive exertion, and the great exhaustion thus entailed may mask any immediate indication of rupture. Later, however, symptoms will show themselves which, while giving no direct evidence of the lesion, will excite suspicion that there is more in the case than can be accounted for by the efforts at expulsion. The rupture will admit of the escape of material—not necessarily in any quantity—into the surrounding parts. The result will be the setting up of some septic action, and according to the seat of this action will be the symptoms which will subsequently arise. There may or may not be vomiting, and there may or may not be difficulty in swallowing.

It will thus be seen that the symptoms of rupture of the œsophagus in this class are very variable and inconstant.

Treatment.—When it has been possible to make a diagnosis, or when suspicions lie in the direction of rupture, the treatment will be as already given under the head of Internal Injuries; and such complications as may subsequently arise will be treated on general surgical principles.

(2) In the second class of cases, where rupture has

occurred in a previously weakened œsophagus, the cause is of a much less violent nature and the symptoms are somewhat more characteristic. In this class probably come most of the cases usually recorded as rupture of the œsophagus. The patient may for some time previously have had symptoms indicating some stomachic or œsophageal trouble. On the other hand, he may have appeared to enjoy good health.

The accident, it appears, occurs most frequently in men who have for long been addicted to alcohol, and arises usually during a fit of vomiting following in some cases a heavy meal. The symptoms in this class of cases contrast somewhat with those of the preceding class. There being no preliminary violent exhaustive efforts at expulsion, the symptoms of rupture are not masked in any way and at once manifest themselves. The patient becomes suddenly faint. The face is anxious and pale, and suffused with perspiration; the pulse is feeble and quickened; the respiration is shallow and somewhat rapid. There may be fruitless attempts to vomit; possibly some dysphagia, and pain more or less localised. The symptoms may increase, and the patient die in a collapsed condition within a few hours. Should, however, the primary shock be rallied from, later symptoms may arise from the escape of material through the seat of rupture into the parts around. These complications will be of a septic character, and may cause death within a few days.

Little need be said of treatment. The same reference may be made, as in the preceding class, to what is indicated under Internal Injuries.

In both these classes of rupture, the lesion in the œsophagus has usually been found to be of a longitudinal slit-like character, situated in the thoracic portion and at some little distance from the diaphragm. There is, however, no special reason for the rupture occurring more at one point than another; the determining causes are probably the site of impaction and the existence of a previously weakened area. In the same way the length of the lesion will be determined by the force of expulsion and by the extent of weakness.

(3) The third class of cases, consisting of those in which rupture has occurred in an œsophagus weakened by gastric

solution, is of comparatively little surgical interest. The accident occurs probably a few hours before death, and is the direct result of an attack of vomiting.

CHAPTER III.

FOREIGN BODIES IMPACTED IN THE ŒSOPHAGUS.

Compared with either disease or injury the impaction of foreign bodies in the œsophagus occupies by far the larger part of the surgery of this region. Little or nothing purely surgical may be needed in cases of disease or injury, but the existence of an impacted foreign body usually calls at some time, either early or late, for surgical interference. The accident is one which may happen to any person, but children and insane people form a class more prone to it than any other. In children it is usually the result of a body which, either in play or as a common habit in early life, has been put into the mouth, and then got too far back to be checked in its passage downwards by any voluntary effort at ejection. Once beyond the fauces the involuntary act of deglutition is brought into play, and if the body escape lodgment in the lower part of the pharynx, it passes on to become impacted in the œsophagus. In the case of insane people the act is a voluntary one. The patient, from some aberrant motive, attempts to swallow a body which frequently, from its irregular shape and hard consistency, readily becomes impacted. In the case of sane adults the nature of the substances is usually that of some article of diet. False teeth, however, are occasionally dislodged and swallowed; and accidents sometimes happen when foreign bodies are inserted into the mouth for purposes of concealment.

Nature of body impacted.—While it is of the utmost importance to the surgeon to know the nature, shape, size, and consistency of the body impacted, there is not much to be gained by an enumeration of the various substances that

from time to time have been recorded as becoming impacted in the gullet. When it is remembered that in insane people the most unlikely objects may be swallowed, and that in children any plaything may prove the obstructing agent, little gain would be got by giving a list of these bodies.

Seat of impaction.—While any part of the œsophagus may become the seat of lodgment of a foreign body, there are certain regions where it more frequently happens. These are the upper and lower ends—opposite the cricoid cartilage and at the diaphragm—and where the left bronchus passes across. At these spots not only is the gullet narrower, but there is not the same proportional amount of distensibility admitted.

Symptoms.—The symptoms which arise in connection with the impaction of a foreign body vary within considerable limits. In the simplest case there may be no other indication of impaction beyond a certain ill-defined feeling of discomfort; while in the severest instance death may almost immediately result either from direct pressure on the trachea producing asphyxia, or reflex laryngeal spasm causing a similar result. Between these limits of sudden death and only slight discomfort an extensive series of symptoms may manifest themselves, either local or general, immediate or remote, and most of them will be determined by the size, shape, and consistency of the body impacted. A large body blocking the canal will give rise to violent symptoms connected mostly with persistent and exhausting endeavours on the part of the patient to eject it. Not only will there be aphagia but possibly also aphonia, with difficulty in respiration, inspiration being affected more than expiration. Pain may be felt either behind or in front, and corresponding more or less to the seat of impaction; in some instances the pain is referred to a region more or less remote from the seat of impaction. The patient will frequently endeavour to vomit, and these futile attempts will as frequently end in severe attacks of retching. There will be great anxiety, with possibly the production of various reflex spasms and neuralgic affections. In cases where there is some likelihood of laceration of the lining wall, from the irregularity and hardness of the impacted body, hæmorrhage to a greater or less extent may follow. Should

the endeavour of the patient culminate successfully in the dislodgment of the body either upwards or downwards, the more violent symptoms will at once begin to subside, but the sense of some impaction may still linger. As already indicated,* rupture of the œsophagus may result during the violent endeavours at expulsion. In cases of a less severe nature, where total obstruction has not been produced, the symptoms will be much less marked. A sharp-pointed body, as a pin or fish bone, may give rise to a pricking sensation at the seat of impaction, accentuated by any endeavour on the part of the patient to dislodge it. Dysphagia may exist, as also retching and vomiting.

Such may be said to be the symptoms arising at the time of the accident, and they constitute the only symptoms should the body be successfully removed within a comparatively short time from its first impaction. If, however, the period be lengthened, either from inability to dislodge the body, or from the fact of the immediate symptoms passing off so that the patient is led erroneously to believe that it has been removed, other symptoms will arise depending upon the nature of the lesion secondarily induced.

If we bear in mind the various structures and tissues in anatomical relation to the œsophagus it is not difficult to conjecture what may be some of the complications likely to result from an ulcerative perforation of the canal. Indeed it may be said that cases have been recorded illustrative of almost every one of these possible complications. Taking them more or less in order of importance, first may be mentioned inflammation, with symptoms of fever and wasting, then ulceration, sloughing, or abscess. In these cases the walls of the œsophagus and the neighbouring cellular tissue may be alone involved. In some cases the surface lesion has led to septicæmia and pyæmia. Ulceration may extend deeply and lead to perforation of the pleural or pericardial cavity, with symptoms of purulent inflammation of these cavities. Again, if the body be sharp pointed, it may itself be the direct means of perforating these cavities, and their contained organs, the heart and the lungs. Similarly perforation may take place into the trachea or left bronchus, producing violent respiratory symptoms. The spinal cord

* See p. 12.

may be wounded. In cases of moderate hæmorrhage the bleeding may come from œsophageal vessels or a thyroid branch; in the severer cases one of the large vessels may be opened, such as the aorta, either vena cava, the innominate, the common carotid, the right subclavian, or the pulmonary artery. Should the body be finally ejected by abscess formation bursting on the surface of the body, fistulæ may remain or œsophageal stricture result.

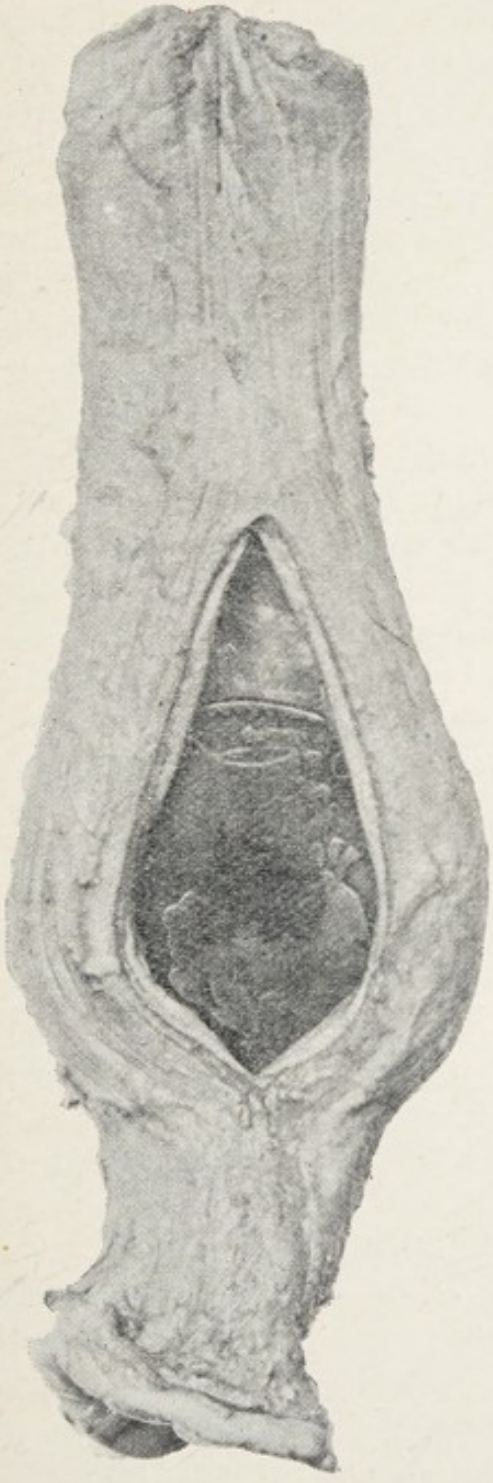


FIG. 1.—Half-crown piece impacted in the œsophagus, just behind the left auricle of the heart. (*Hunterian Museum, University of Glasgow.*)

Diagnosis.—From the symptoms described it will be seen that much latitude exists in the degree of certainty which can be attached to any supposed case of impaction of a foreign body in the gullet. While on the one hand no difficulty whatever may be present, on the other it may be quite impossible to say whether the body is still impacted or has been dislodged. Whenever it is possible to obtain reliable information of the occurrence of the accident, considerable assistance is lent towards making a diagnosis, notwithstanding the obscureness of the symptoms otherwise. In the case of young children and insane people, the symptoms are often the only indication, and if these be not distinctive

the diagnosis, if not impossible, may be very difficult. As regards the seat of impaction, information may be obtained from other sources than those which the patient may be able to indicate. Thus in the neck a body of sufficient size may be felt by palpation. Lower down, auscultation over the spine may prove of service; the sound produced by the impact of fluid in deglutition indicating both the existence and the seat of obstruction. Better still, the introduction of a bougie or sound which will give evidence of some hindrance to its passage. Where a 'knobbed' bougie is used, the metal or ivory knob may be heard to strike the body. Œsophagoscopy has in many instances proved of value.

It must be remembered that even in cases where no doubt exists as to the occurrence of such an accident and marked symptoms are present, yet difficulties may stand in the way of an accurate diagnosis. For on the one hand there may be no obvious sense of obstruction felt by the patient, and the passage of a bougie may also fail to detect the impacted body. Again, a body may be successfully pushed on into the stomach, without any immediate abatement of the symptoms.

It is impossible to over-estimate the value which attaches to the use of the Roentgen Rays in the detection of foreign bodies impacted in the œsophagus. Not only will much of the past difficulty disappear in the certainty with which the existence of a foreign body will be verified, but the whole subject of treatment will become simplified by the knowledge of the shape, situation, and lie of the object.

Prognosis.—The many possibilities which exist as long as a body remains impacted in the œsophagus render it impossible to say what may be the ultimate result in any one case. The first considerations of importance are the nature of the impacting body and the urgency of the immediate symptoms. As a rule there is a direct relation between these two conditions. The larger, harder, and more irregular the substance impacted, the graver will be the symptoms, and if in these severer cases immediate relief is not afforded by removal of the body, a fatal result rapidly ensues. A successful dislodgment, however, of the obstructing material is quickly followed by complete abeyance of all symptoms. The exceptions to this latter result are those comparatively rare cases of rupture of the œsophagus

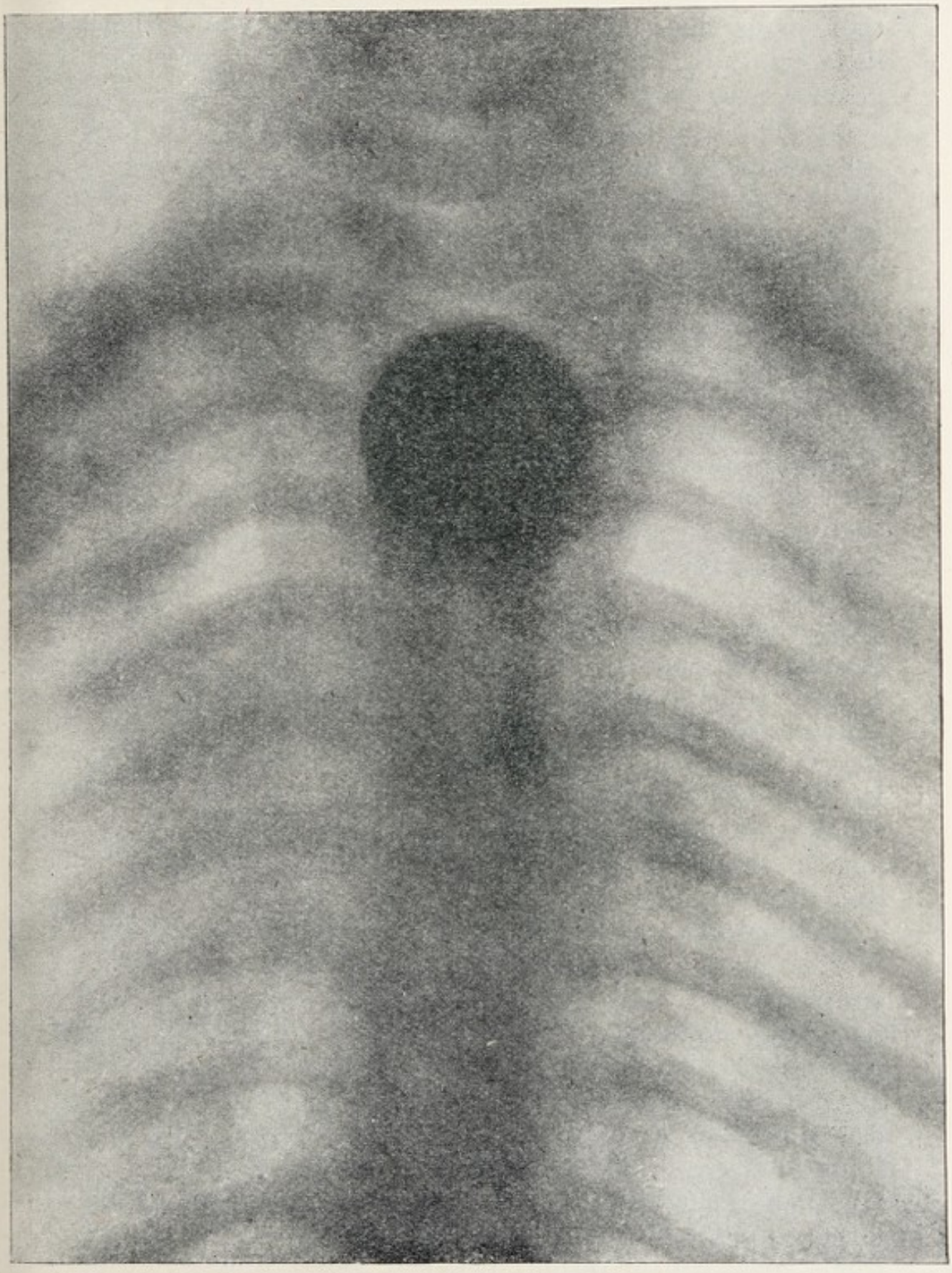


FIG. 2.—A half-penny impacted in the œsophagus. (*From a Skiagraph taken by Dr. John Macintyre, Glasgow.*)

occurring at the time of ejection of the body. When the symptoms are not urgent at the first, the prognosis again turns upon the nature of the impacting body and whether it is likely to be dislodged by operative measures or by natural processes. The more a substance approaches something which is likely to stick into the walls of the gullet, the less, speaking generally, is the chance of its removal either naturally or by operation. Again, the longer such a body remains impacted the graver becomes the prognosis. While therefore it must always give cause for anxiety as long as bodies of this description are within the œsophagus, nevertheless not a few cases are now on record showing that, at periods of variable length from the date of the accident, dislodgment has taken place and complete recovery resulted. It should, however, be stated that where nature has been the means of gradually loosening and finally dislodging the body the latter has been rather of the nature of a rounded than a pointed substance.

The loosening of the body, and its dislodgment, result either from some relaxation of spasm or from ulceration, after which it may pass down into the stomach, or be ejected through the mouth in a sudden violent attack of retching. In other cases the body becomes the nucleus of an abscess, the bursting of which externally causes it to be discharged. Again, sharp-pointed bodies such as pins and needles have worked their way harmlessly through the tissues and been finally extracted from beneath the skin. Lastly, the body may become encysted and remain perfectly inert throughout life.

Treatment.—In discussing the treatment to be adopted in the removal of foreign bodies from the œsophagus, the considerations connected with it may be said to be on a par with those connected with the diagnosis of the seat of impaction and the nature of the impacted body. The more accurate the knowledge of the body and its connections, the easier becomes the choice of the most suitable method for its removal, and the more likely is success to follow. The treatment therefore to be adopted in any case depends largely upon facts ascertained with regard to it. Without some such consideration between cause and treatment, operation may do more harm than good. Every case therefore has to be treated on its own merits, and may call for

special ingenuity on the part of the operator to adopt measures suitable for the case under consideration. As then it is not possible to state any general method that should be adopted in every case, I shall simply describe the various measures that are in use, and indicate such few as exist for dealing with special cases.

Use of an anæsthetic.—The question of the administration of an anæsthetic will sometimes arise. It has both its advantages and disadvantages. In the case of children an anæsthetic admits of a more careful examination of the œsophagus, and of the adoption of any of the milder measures for the removal of the obstructing agent. In adults it removes, what is sometimes of much assistance, the help that the patient is able to give; and it also entails the patient being in a recumbent position. The question of the giving of an anæsthetic is more or less determined by the amount of resistance which the patient is likely to offer to measures adopted either for diagnosis or treatment.

Various methods of treatment: (1) *By manipulation.*—Should the body be lodged in the cervical portion of the œsophagus and be of a soft nature, it may be possible to alter its shape so as to admit of its being ejected. Or, again, it may be possible, by manipulating it, to work it upwards or downwards. As the finger cannot reach usually beyond the cricoid cartilage, little good can be effected by internal manipulation.

(2) *By administration of solid food.*—In cases of such bodies as fish bones, pins, &c., which do not prevent deglutition, it is sometimes possible to dislodge them by the administration of solid food. The patient should be induced to swallow reasonably large pieces of partially masticated dry crusty bread or masses of boiled mealy potatoes.

(3) *By emesis.*—Some judgment needs to be exercised in deciding whether a patient should be induced to vomit or not. Where it is thought likely that the impacting body might perforate the walls of the œsophagus no vomiting should be encouraged. On the other hand, in the case of articles of diet not likely to injure the canal, and which have not already led to retching or vomiting, emesis may be tried.

One of the best means for inducing vomiting, and one which was strongly advocated by Syme, is to irritate the

back of the throat with a feather. In the case of young children it is a very good plan to turn the child on to its stomach, allow the chest to rest upon a pillow, and then insert the finger into the back of the throat. The child then retches, and the foreign body coming up into the back of the pharynx, drops down out of the mouth. Coins and such like bodies are often effectually got rid of in this way.

(4) *By probang, bougie, or coin catcher.*—The most serviceable kind of probang is that known as the bristle probang, or, as it is sometimes termed, the horsehair parasol. It is



FIG. 3.—Bristle Probang.

fitted with a piece of sponge at the extremity, and the bristles are capable of being expanded into a parasol-like shape (Fig. 3). This instrument can be used either with the object of forcing the obstacle on into the stomach, or, as is more frequently the case, for extracting it by the mouth. In the first instance the probang will not pass by the obstruction, while in the second it must do so. In the passage of a probang or bougie a few anatomical points should be borne in mind. As the result of measurements taken in fifty-five subjects, Maurice H. Richardson showed that "the distance from the upper incisors to the opening in the diaphragm when the head is thrown back is not constant. The average distance is fourteen and a half inches. There is also no constant ratio between the height of the individual and the measurement. If, however, the individual is of average height and with a neck of ordinary length, it is safe to say that the distance from the incisors to the diaphragm is about fourteen and a half inches. If the probang is arrested at a point more than thirteen inches from the incisors, the point of obstruction is probably at or near the cardiac end of the œsophagus."

If the probang passes by the obstruction, the parasol is then expanded and withdrawn. In using a probang for propulsion purposes, it must be remembered that the endeavour is not free from danger. Cases are recorded of

serious and even fatal results from the forcible use of the instrument.

The remarks made regarding the use of the probang equally apply to the employment of the bougie. It may be useful to remember that when propulsion suggests itself as feasible, other means more readily at hand may be used in place of the proper bougie. Thus the stem of a leek has proved effectual; also a whip handle. The coin catcher (Fig. 4) is more especially fitted for the purpose which

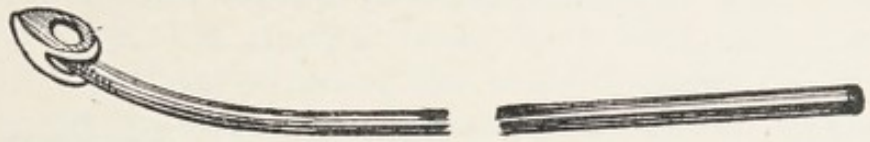


FIG. 4.—Coin Catcher.

its name suggests, although it sometimes is of service for the extraction of other objects.

Difficulties sometimes arise in withdrawing both the probang and the coin catcher. Such happen from the locking of the instrument with the foreign body. In accidents of this nature the instruments should be pushed down again and some slight rotatory movement adopted, when another attempt may be made at withdrawal. In no case should force be used, and when all reasonable endeavour fails at withdrawal, œsophagotomy will have to be performed.

(5) *By forceps.*—The kind of foreign body for which the forceps is best suited is that which is too large and too fixed to be extracted by the probang. It is limited also in its use—in the simpler forms—to obstacles situated nearer the upper than the lower end of the gullet. In using the forceps, it should be remembered that the body to be extracted has to be drawn up through the narrower part of the canal opposite the cricoid cartillage, and therefore no force should be exercised if a hitch takes place at that point.

Various kinds of forceps will be found depicted in the text-books, many somewhat complicated both in their construction and in their use. The simplest, and for all practical purposes the best, is the long-shanked œsophageal forceps with a slight bend near the biting portion (see Fig. 5). This instrument can only remove bodies from near the upper end, and it is a question whether, with the more

complicated forceps, made so as to reach farther down the canal, it is wise to withdraw a body that is impacted in the lower part. For although it might thus be removed without injury to the canal, less risk would probably be run by gently pushing it on into the stomach, or by opening the œsophagus in the neck and attempting extraction through the wound. In some cases it has been found possible to lessen the impaction of the body by dilating the œsophagus either above or below the seat of obstruction. For this purpose a large-sized dilator—such as is used, and will be described

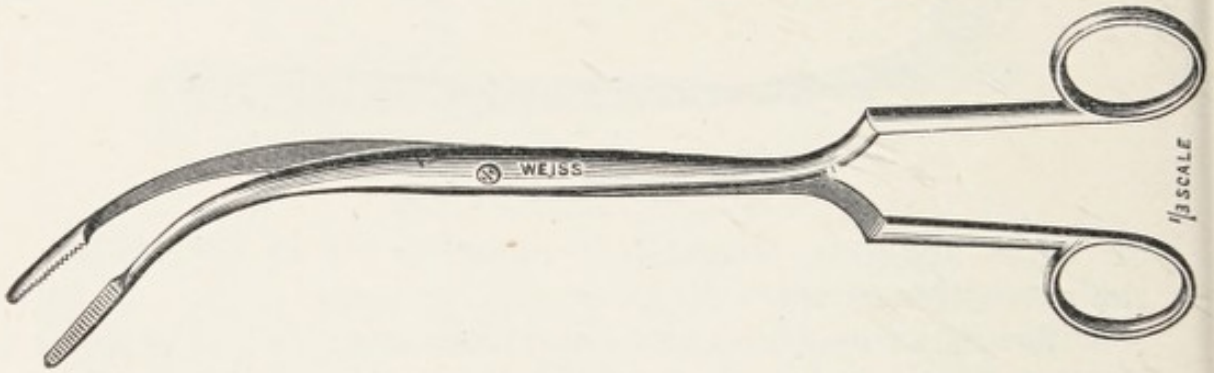


FIG. 5.—Œsophageal Forceps with Perpendicular Curve.

later, for stricture—may be passed down to the obstruction. Elastic bags, capable of inflation either by air or water, have been used for the same object. In using the forceps a gag is necessary, and care should be taken to see that it is securely fixed Otherwise difficulty may arise just when the body reaches the vicinity of the glottis.

(6) *By special means for particular cases.*—The removal of a fish hook which has "caught" the walls of the gullet calls for a special method for its extraction. In all the cases recorded the hook has been accidentally swallowed while still attached to a piece of thread or gut; and it is this latter which constitutes the chief aid in the process of extraction. The plan is to pass the line attached to the hook through either a solid substance or a long hollow bougie. In the former case the weight of the substance, when it has slipped down to the hook, dislodges it; and in the latter, as soon as the hollow bougie reaches the hook, the force applied in pushing it on causes the hook to be withdrawn.

(7) *By œsophagotomy.*—Failing every endeavour to extract the body by the mouth, the question of operation will

arise. The points to be considered will be the nature of the body—its size, consistency, and contour; its position, the urgency of the symptoms; and the remote possibilities, whether it may by natural processes become dislodged or whether it may give rise to dangerous complications. It will thus be seen that the question of operation may be one of considerable difficulty to decide. The feeling among surgeons nowadays is rather to operate than to delay when in doubt, and the success which has attended operative interference adds further encouragement in that direction. It is probable that many a large body will pass down the œsophagus without injuring the walls, because its progress is helped by the natural downward contraction of the constrictor muscles and the circular muscular fibres of the gullet; but when an attempt is made to pull the body up, the same muscles which helped it on now impede its return; and hence, while the mucous membrane escaped any injury in the downward course of the object, it is liable to be lacerated—and possibly the other tunics also—in its forcible extraction upwards. Much more does this reasoning apply to hard, irregularly shaped bodies, which are much more likely to produce serious injury to the walls of the gullet than coins and suchlike objects. It is useful to remember that the finger inserted into the œsophagus at the cervical wound can reach the arch of the aorta, and even hook the finger under it in some cases. Thoracic œsophagotomy has been suggested for cases of impaction below the reach of the cervical operation.

(8) *By gastrotomy.*—In cases where the body has become impacted at the lower end of the gullet, and its removal is considered imperative, it can be successfully reached through the stomach. The incision into the stomach should be made towards the cardiac extremity. It will rest with the surgeon to decide whether he should attempt to remove the body through the gastric wound or upwards through the mouth. If he select the latter course, a threaded bougie should be passed from below upwards by the obstruction, then after tying into the thread a pledget of tissue, traction should be made through the mouth, when the body will be dislodged and drawn out. This method has succeeded on several occasions.

CHAPTER IV.

INFLAMMATORY AFFECTIONS OF THE ŒSOPHAGUS : ACUTE TRAUMATIC ŒSOPHAGITIS ; ACUTE IDIOPATHIC ŒSOPHAGITIS ; ŒSOPHAGITIS OF CHILDREN ; MEMBRANOUS OR PELLICULAR ŒSOPHAGITIS; APHTHOUS ŒSOPHAGITIS ; CHRONIC ŒSOPHAGITIS ; PHLEGMONOUS ŒSOPHAGITIS ; SUBMUCOUS ŒSOPHAGEAL ABSCESSES ; CATARRHAL ŒSOPHAGITIS ; FOLLICULAR ŒSOPHAGITIS ; CROUPOUS ŒSOPHAGITIS.

Arising from whatever cause, œsophagitis is a comparatively rare disease. It is most commonly met with as an involvement of inflammation of the pharynx or stomach. Whatever may be the general symptoms present in these cases, those connected directly with disease of this particular part are as a rule more or less masked by the symptoms arising from the affection of the other regions. Treatment, therefore, has reference often rather to these latter than to the former. Again, it may be said that inflammatory affections of the œsophagus will more frequently fall to the hand of the physician for treatment than the surgeon. Occasionally, however, either as an immediate result of the inflammation or as an after effect, symptoms may arise calling for surgical treatment. I propose therefore to refer briefly to these various inflammatory conditions. It is doubtful how far one is right in speaking of these different affections as various forms of inflammation. It is quite possible, and indeed probable, that differences are due more to the degree or intensity of the inflammation than to its kind.

Acute traumatic œsophagitis.—Acute inflammation the result of injury is the form most commonly met with. It may arise as the result of mechanical injury, as in the impaction of a foreign body ; as the consequence of a sting

of an insect, as in the case of a wasp accidentally swallowed; or, as is most commonly the case, as the result of swallowing some powerful irritant.

Symptoms.—In the case of the imbibition of caustics or corrosives, it very commonly happens that the symptoms arising from the injury to the parts above and below mask those which would otherwise indicate involvement of the gullet; but when sufficiently pronounced to assert themselves, they will be found to consist mostly in a burning sensation felt down the neck and in the chest, pain to a variable extent, tenderness on palpation of the gullet, and more or less pain at any endeavour to swallow. In the case of stings of insects, or impacted foreign bodies, the inflammation may be of a more local character. Pain may be referred to a particular point either behind or in front, above or below, according to the locality of the mischief, and it may be similarly localised in any attempt at swallowing.

Prognosis.—In the case of stings of insects, the cases reported are too few to admit of any certain statement. It is probable, however, that the effect of a sting in any case will vary in the œsophagus, just as much as it does when the skin is the seat of the lesion. Since in the latter case it is rarely of any moment, it may be assumed that no serious result will ensue when the gullet is attacked. As regards œsophagitis due to the other traumatic causes named, the danger lies not so much in the acute condition of the part itself at the time as in the after effects. If the acute inflammation leads to ulceration, then all the troubles connected with a traumatic stricture of the canal must be expected.

Treatment.—Little or nothing can be done as regards the part itself. Rest being the object required, nutrition should be effected as long as possible by nutrient enemata. A little ice may be given to relieve any dry or parched feeling of the mouth. Any pain or anxiety may be overcome by subcutaneous injections of morphia.

Acute idiopathic œsophagitis.—To the late Sir Morell Mackenzie belongs the credit in this country of drawing attention to a well-defined, though apparently excessively rare, form of œsophagitis.

Symptoms.—One of the most marked symptoms is pain in the act of deglutition, which is frequently of a severe

burning or tearing character. Pain of a dull aching kind is also often felt deep in the neck and chest. Tenderness is complained of on external palpation of the œsophagus; and any movement of the neck, or even the movement involved in speaking, sometimes augments the patient's suffering. Feverish symptoms exist. The patient complains of dryness of the mouth and thirst, notwithstanding the constant expectoration of frothy mucus. Delirium is sometimes present. Should the inflammation proceed to ulceration, the expectoration may become tinged with blood. The formation of an abscess may be indicated by rigours and the augmentation of the patient's symptoms.

Diagnosis.—While the extreme difficulty and pain in swallowing will prove positive factors in localising the disease, the absence of certain other symptoms will more largely assist in determining the diagnosis. Thus, the exclusion of any mischief connected with the pharynx or the air passages; the absence of symptoms suggestive of hydrophobia, as general hyperæsthesia, paroxysms of asphyxia, and mental aberration; the non-existence of pericarditis, which either through pain or pressure might mislead.

Prognosis.—In most cases the prognosis appears to have been favourable. In Mackenzie's five cases all did well. Ulceration may take place and abscess may form. Gangrene also has occurred, but it must be considered an extremely rare sequel.

Treatment.—Little further need be stated than has already been said in the treatment of acute traumatic œsophagitis. Warm fomentations will, when applied to the neck, sometimes afford relief. Placing the feet in hot water may be tried with advantage. Belladonna plasters applied to the back, or the liniment rubbed into the skin, will relieve pain. In four out of Mackenzie's five patients subcutaneous injections of morphia were administered with good effect.

Œsophagitis of children.—The form of œsophagitis here referred to occurs in children usually under two years of age, and most frequently within the earlier months of infantile life.

The cause of the complaint, so far as ascertained, appears to be bad feeding. Infants have been fed on artificial food,

such as 'sweetened gum-water and milk and water' given too hot, or the mother or nurse has sore nipples or a defective quality of milk.

Symptoms.—The first and foremost symptom appears to be 'an antipathy to food, and when food is taken lachrymation takes place.' This latter symptom is deemed almost pathognomonic. Further, any attempt to swallow being accompanied with pain, the child cries and ceases to suck; and any food which may have been swallowed is promptly thrown up, frequently before it has had time to reach the stomach. Pressure on the œsophagus through the neck may cause pain. The child frequently suffers from diarrhœa, and is in all general respects very ill. Sometimes collapse becomes a prominent feature, at other times convulsions.

Diagnosis.—The condition is not one always easy of diagnosis. The rapid vomiting after deglutition may suggest some congenital malformation of the canal, or some cerebral mischief; and the diarrhœa, which is a frequent accompaniment, may indicate gastro-intestinal disturbance. In vomiting, however, the result of malformation, "all the milk is ejected, and paroxysms of suffocation are brought on by attempts to swallow" (Mackenzie). Again, in vomiting due to gastric disturbances the act is usually accompanied with nausea, and in vomiting due to cerebral irritation the food is not so powerfully ejected (Bruce).

Prognosis.—Judging from the cases reported, the disease appears a very fatal one, causing death either by inanition, or more directly through the disease itself.

Treatment.—No endeavour should be made to force the child to take fluid by the mouth. The best treatment is to give injections *per rectum* of milk and broth. This should be done every three hours. The child's neck should be wrapped round with warm fomentations. Before attempting to resume administration by the mouth, attention should be directed to the mother's nipples, or if the child has been artificially fed, to the food and the mechanical means used for its administration.

Membranous or pellicular œsophagitis.—The formation of membrane within the œsophagus may be due to diphtheria, the swallowing of boiling water, or other more obscure causes. In the case of diphtheria the membrane is

usually an extension from the pharynx, the disease is of a severe and extensive type, and any œsophageal symptoms are usually masked by those arising from the involvement of other parts. As a rule the existence of a diphtheric membrane in the œsophagus may be said to be a purely post-mortem revelation. Few, if any, authenticated cases are on record of recovery.

With regard to membranes or pellicles which form in the œsophagus as the result of drinking boiling water, Wilks and Moxon mention having seen two such cases. It would appear that cases arising from this cause are of little more than pathological interest, for death usually results from the injury simultaneously inflicted upon the fauces and larynx.

Aphthous œsophagitis.—As an affection of itself thrush of the œsophagus rarely, if ever, occurs. When the gullet is attacked it is almost always in association with a similar condition of the mouth or pharynx, more frequently the combination is with the mouth and the œsophagus. The diagnosis of involvement of the gullet depends almost entirely upon the difficulty of swallowing, occasionally accompanied with vomiting. The disease usually attacks infants, and but rarely leads to a fatal issue.

Chronic œsophagitis.—Although a rare affection, chronic inflammation of the œsophagus is occasionally met with. It is usually the result of some prolonged irritation of the lining membrane of the canal, either from continuous and frequent indulgence in ardent spirits or a similar habit of taking foods too hot or too irritant. It is said also to follow upon some traumatic abrasion of the wall, and as a sequel to acute œsophagitis. A certain degree of inflammation is co-existent with syphilitic ulceration and carcinoma, and is the result not unfrequently of some organic obstruction. It is, however, as an unassociated disease that it is dealt with here.

Symptoms.—The inflammation being slow in its progress, the symptoms are insidious, and at first somewhat obscure. Later, however, dysphagia manifests itself, accompanied frequently with pain, at an early stage, only when swallowing solids, but later when taking fluids. As in the acute form of the disease, there is an increase in the expectoration of frothy mucus, only to a much less extent. In any

attempt at deglutition, auscultation of the œsophagus may reveal a delayed progress of the bolus downwards, accompanied with "a loud harsh noise if the surface of the mucous membrane be roughened" (Mackenzie). The existence of the dysphagia may lead the surgeon to pass a bougie, when it will be found to be obstructed in its course. Such instrumentation, however, should be avoided if possible, especially when the symptoms are sufficiently clear to indicate the true nature of the affection. The passage of a bougie only tends further to irritate the mucous membrane, give pain, and often cause some bleeding.

Diagnosis.—The disease may be mistaken for spasm of the œsophagus; for some laryngeal disease; or for commencing carcinoma. In the case of spasm of the œsophagus the affection is transitory, the difficulty of deglutition being both sudden in its onset and in its disappearance. From laryngeal disease about the orifice of the larynx giving rise to dysphagia, the laryngoscope will show the absence of any inflammatory mischief in these parts. While from carcinoma the age of the patient may lend some assistance; but the subsequent course of malignant disease will soon exclude any possible mistake.

Prognosis.—With proper treatment these cases rapidly improve and get well; but recurrence is frequent.

Treatment.—The cause being some irritant, the treatment consists, in the first place, in removing such source of irritation, and keeping the part as much as possible at rest. This is best accomplished by a careful regimen, by which everything of an irritant nature is forbidden, while simple bland foods are alone permitted. Internal administrations are of little good. If pain exists it may be relieved by the application of a blister, a mustard poultice, or a hot fomentation. Hypodermic injections of morphia may also be resorted to.

Phlegmonous œsophagitis and Submucous œsophageal abscesses.—Under the heading of Phlegmon of the Œsophagus, Puech reports the case of a man who swallowed a tablespoonful of a solution of caustic potash and soda. At the end of eight days he vomited a long tubular cast in two portions, one measuring twenty-four centimetres in length, and the other, triangular in shape from the mucous membrane of the stomach, measuring twenty-two milli-

metres. The man died, but no autopsy was made. The author believes that a veritable phlegmon was produced. It may be a question whether, as a matter of classification, this case should not occur as illustrative of what has been described as membranous œsophagitis. In many, if not in all respects, it resembles the cases included under that heading.

The conditions in this class of œsophageal inflammation are, however, of little clinical significance, and have an interest more for the pathologist than the surgeon. I merely allude to them in order to complete the list of the various inflammatory affections to which the œsophagus is subject. To this end must also be mentioned **Catarrhal** and **Follicular œsophagitis,** both affections which have been described as attacking solely the mucous membrane. **Croupous œsophagitis** consists in an infiltration of the submucous and muscular coats with pus, while the mucous membrane remains intact.

CHAPTER V.

ULCER. VARICOSE VEINS. SYPHILIS. TUBERCULOSIS. ACTINOMYCOSIS.

Ulcer.—Several cases of simple chronic ulcer of the œsophagus have now been recorded, and no doubt can longer be entertained of the occasional occurrence of an ulcer in this region similar in all respects to that more commonly met with in the stomach (see Fig. 6). Ulceration may occur in the course of the affections already described, for instance, as a sequel to the impaction of a foreign body, or in the course of some acute inflammatory affection of the canal. Stricture resulting from any cause gives rise to ulceration of that part of the gullet immediately above the obstruction. Syphilis, malignant disease, tuberculosis, and many of the acute exanthemata attacking any part of the canal may lead to ulceration. A form of ulceration arising from gastric solution and leading to rupture has been previously referred to (see page 7).

Symptoms.—The occurrence of ulceration can often only be suspected, and in some cases not until perforation takes place. Again, it may be said that the existence of ulceration is more frequently a post-mortem revelation than a clinical observation. Where there are diseases existing in which it is known that ulceration may take place, the appearance of blood in the sputum and the localisation of pain in some particular spot during deglutition may lead to a correct diagnosis.

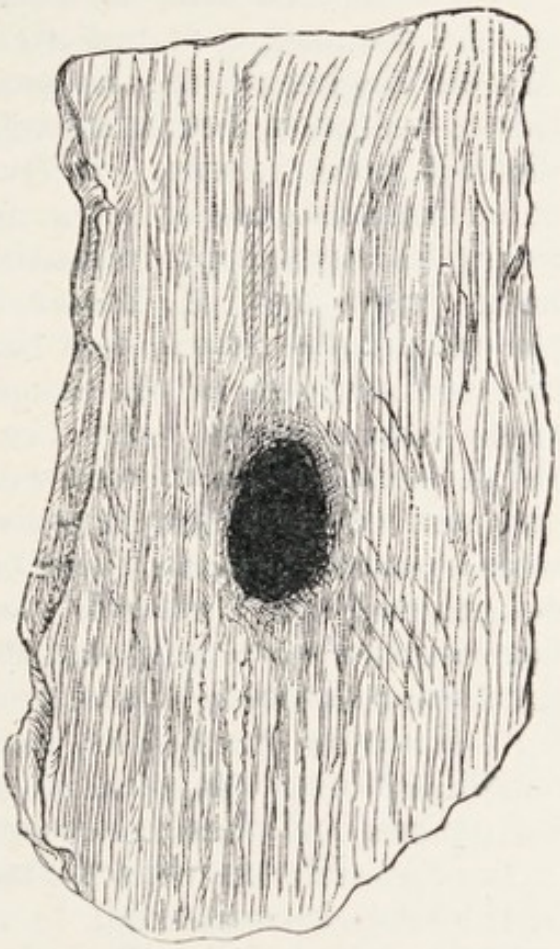


FIG. 6.—Simple Perforating Ulcer of the Œsophagus. The Main Bronchus of the Left Lung was penetrated. (COATS.)

Prognosis.—Ulcers, from whatever cause, may lead to perforation. Such perforations are more frequent in carcinoma of the œsophagus; these will be more extensively referred to under the discussion of that disease. The simple ulcer corresponding to that found in the stomach may lead to perforation. In the case figured the bronchus was opened into. As to the results which may accrue from the healing of an ulcer, these will depend upon the depth and superficial extent to which ulceration has taken place. Where there has been much destruction of the wall there will be a correspondingly larger formation of cicatricial tissue, and this must lead to narrowing of the calibre of the canal.

Treatment.—An ulcer in the œsophagus must be treated on the same broad principles which characterise the treatment of ulcers in the stomach and elsewhere. Rest alone is needed, and if for any purpose it is necessary to pass a bougie or a tube, this must be done with great care. As long as it is possible to keep up the patient's strength by

nutrient enemata, nothing except a little ice, or a little bland fluid of some kind, should be given by the mouth. It is not merely the passage of substances over the surface of the ulcer which must be considered, but the disturbing effect of the muscular contraction caused by deglutition.

Varicose veins.—The existence of varix or phlebectasis in the œsophagus is not an infrequent occurrence. Thus Morell Mackenzie, in the examination of eighteen gullets taken at random, found more or less dilatation in seven and distinct varix in two. Frequent, however, as would seem to be the existence of some degree of this condition, it is rarely that symptoms indicative of it arise. It has recently been shown by C. A. Blume, of Copenhagen, who injected the œsophageal vessels, that the submucous veins empty into the coronary vein of the stomach, while the periœsophageal veins communicate with the diaphragmatic and azygos veins. Obstruction therefore occurring in the liver, as from cirrhosis or senile atrophy, gives rise to a dilatation of the submucous veins; and these being connected with the periœsophageal, an increased vascular connection is formed between the portal vein and the vena cava. Such increased connection between these two large veins is said to retard for a time the progress of ascites in cases of cirrhosis, but the dilatation of the veins so occasioned renders them liable to rupture, and thus to become the cause of hæmatemesis.

It is possible that in some instances the varicose condition of the veins is congenital.

The position of the affected veins may be above, below, or at any intermediate place in the gullet. In obstructive disease of the liver they appear more frequently at the lower end; while in old age, when varices are prone to form in various regions, they are found more at the upper part.

Symptoms and diagnosis.—The recorded instances of uncomplicated cases of varix are far too few to admit of any special symptoms being stated that might be termed pathognomonic of the complaint. When hæmorrhage results from varix, in which the latter condition is dependent upon some obstructive influence working on the portal circulation through the liver, it is all but impossible to say whether the blood is from the stomach or the gullet. Blume affirms that when the hæmorrhage is due to a rupture of the varicose veins, the blood is ordinarily expelled by a sort of

regurgitation without vomiting. In cases of varix occurring at the middle and upper part of the œsophagus, Mackenzie asserts the possibility of establishing a diagnosis by means of the œsophagoscope, and in one of his own recorded cases he was enabled to do so. In the absence of any other symptoms suggestive of disease of the liver, the cause of the hæmorrhage might be suspected to be in the œsophagus. Here again, however, the diagnosis would more likely be that of gastric ulcer, and it would be difficult to distinguish between the two complaints. The hæmorrhage from a ruptured vein may be sufficiently copious to cause death.

Treatment.—Where there is reason to suspect that blood is coming from varicose veins of the œsophagus, the treatment will be in all respects such as would be adopted in the case of gastric ulcer. Cold may be applied externally either to the sternum and epigastrium or to the back. Ice may be sucked, or astringents may be administered. Zenker advises tincture of the perchloride of iron in doses of five to ten drops. Mackenzie prescribes a mixture of tannic and gallic acids. Nutrient enemata should take the place of food by the mouth so long as the tendency to hæmorrhage exists; but when bleeding seems to have ceased iced milk may be given, and a milk diet maintained for some time.

Syphilis.—The lining membrane of the œsophagus, like the skin and mucous membrane elsewhere, is liable to be attacked by some form of syphilitic inflammation. This is, however, a rare complication of both the hereditary and acquired forms of the disease. Pathologically considered, the lesion is mostly some form of ulceration, either superficial where the mucous membrane is first involved, or deep where the primary source has been a gumma. The result in both cases is the same; healing usually takes place, and the cicatrix formed may or may not give rise to stricture of the canal according to the depth and extent of the original lesion. Syphilis is sometimes the cause of œsophageal paralysis; but in such cases the lesion is primarily connected with the nervous system, and the gullet thus secondarily involved.

Symptoms.—The chief symptom is that of dysphagia, comparatively slight at first, but gradually increasing as the canal becomes narrowed. During the active stages of ulceration some slight hæmorrhage may exist and localised pain

be complained of. The various symptoms arising from stricture due to this disease will be more fully discussed in the chapter dealing with cicatricial stenosis.

Diagnosis.—There will be little difficulty in deciding that the symptoms of obstruction are due to some organic lesion, but it will not be so easy to determine whether or not the exciting cause is syphilis. There is nothing special in the symptoms to distinguish them from those dependent upon ulceration or stricture due to other causes, and the diagnosis—almost always conjectural—must be based on the existence or pre-existence of syphilitic manifestations elsewhere.

Treatment.—The usual specific remedies will be called for, especially iodide of potassium; for the disease, when it comes under treatment, is usually in its later or tertiary stage than in the earlier. In addition nourishment must be administered on the principle of giving rest to the part, and on the general lines before laid down in all cases of ulceration. The treatment of stricture will be dealt with later.

Tuberculosis.—There is little to be said about this disease. As a primary affection there appear to be no really authenticated recorded instances. The œsophagus is some times secondarily involved in tubercular processes taking place elsewhere. The most frequent method of involvement is by extension from a tuberculous gland, which gradually eats its way into the œsophagus and so infects it. Another mode of invasion is directly from the larynx. A third source of infection arises from inoculation of a part of the canal—previously injured by swallowing some caustic fluid—by swallowing tubercular sputum in cases of pulmonary phthisis. A fourth kind of involvement is where the disease of the œsophagus is a part of a general miliary tuberculosis.

The disease cannot be said to have any special surgical interest, and indeed its existence as yet has been little else than a pathological curiosity. Why the œsophagus should be so exempt from infection it is not easy to say, unless it be, as suggested by Weichselbaum, that the virus, which may attack other parts of the alimentary canal, passes too rapidly down the œsophagus to seize upon its walls.

Actinomycosis.—A few cases have been recorded of this disease, both primary in its origin in the gullet and secondary by invasion from the mouth. The infection of the part is supposed to be by some foreign body, such as an ear of corn itself carrying the infecting micro-organism. As in other parts of the body, the tendency of the disease is to progress, invade other organs or tissues, and produce thereby symptoms characteristic of the parts involved. While the disease usually runs a fatal course, some good may be effected by the administration of large doses of iodide of potassium, and the surgical treatment of abscesses, fistulæ, &c. The dysphagia and pain which accompany the advance of ulceration in the gullet must be treated on the usual lines.

CHAPTER VI.

TUMOURS: INNOCENT—PAPILLOMA. CYSTS. FIBROMA. ADENOMA. MYXOMA. MYOMA. LIPOMA.

Various kinds of benign tumours, as pathologically understood, have from time to time been found attached to the inner wall of the œsophagus. Occurring, however, in whatever form, they are but rarely met with, and still more rarely diagnosed. Although innocent structurally, they have in some cases, from the special nature of the region attacked, given rise to severe symptoms, ending fatally. It would seem, however, that in not a few cases there are no symptoms at all, and quite accidentally tumours have been discovered after death. As in malignant tumours, these benign growths are found more frequently in men than in women, and for this reason it has been assumed that irritation, caused mostly through the consumption of alcohol, is the exciting cause of some topical development.

The benign growths which have been found in the œsophagus are warts or papillomata, cysts, fibromata, adenomata, myxomata, and myomata. Some authors add also lipomata; but while instances are recorded illustrative of

each of the former growths, there appears no authentic reference to a case of the latter.

Warts or Papillomata.—These growths appear to be hypertrophied papillæ of the mucous membrane, covered with additional layers of epithelium. They may be said to resemble warts on the skin, and, like them, may be simple or multiple. They may exist in any part of the canal, and are sometimes sprinkled over its entire length. They are found usually in elderly people, and are unaccompanied by any special symptoms.

Cysts.—In most cases these are simple retention cysts arising in connection with the mucous follicles. When of such a nature they are not usually large, rarely exceeding in size a pea, and do not number more than one or two. They contain viscid mucus. Instances of much larger cysts than these have been recorded.

Fibromata, Adenomata, Myxomata, and Myomata.—These growths constitute relatively the most frequently met with forms of benign tumours. They usually occur as polypi attached by a distinct neck or constricted base to any part of the wall of the gullet, although the region of the cricoid cartilage is perhaps the most usual spot. In size they vary considerably, being as a rule much greater in length than breadth.

Symptoms.—With so few recorded cases and with such inconstancy in the symptoms presented, it is not possible to indicate any features which may be said to be generally characteristic of polypus of the gullet. Dysphagia, which would naturally be the most likely symptom to exist, is often absent, and that too in some of the most marked cases. When the polypus moves freely by a long pedicle, it may, by coughing or retching, be brought up to the back of the throat or into the mouth.

Treatment. —The removal of the polypus is the only object to be aimed at, and this has been effected in some cases accidentally, and in others by similar simple methods to those used in the case of nasal polypi. When the pedicle is long and the patient made to cough or retch it may be seen at the back of the throat and can then be easily caught by a pair of forceps and either twisted off or removed by an écraseur. In other cases the polypus may be extracted by withdrawing an expanded parasol bougie. In whatever way removed, a

little hæmorrhage usually follows the detachment of the growth, but this soon subsides, and after a few days of painful deglutition, variable in degree, the patient makes a complete recovery.

CHAPTER VII.

TUMOURS: MALIGNANT—CARCINOMA AND SARCOMA.

Carcinoma.—Etiology.—Whatever may be the real incentive to the commencement of the disease, it is usual, with our present knowledge, to ascribe its origin to a predisposition of the tissues, incited to undergo these special changes by some mechanical injury to the particular part.

Statistics leave little doubt that the disease is far more frequent in men than in women; thus in 100 cases collected by Morell Mackenzie the disease was found 71 times in men and 29 in women. The age at which it most frequently appears is from 50 to 60 years. The decades immediately before and after this show equal frequency, and in both cases but slightly numerically less. Before 20 years and after 80 years the œsophagus is rarely affected.

Pathology.—No portion of the œsophagus is exempt from invasion. From its commencement to its termination carcinoma has attacked any region, and any part of that region. Various portions of the tract have been singled out as more frequently involved than others, but the want of uniformity in the results obtained by different statisticians renders it almost impossible to indicate one part more than another as being specially prone to the disease. Butlin is probably right in giving the central portion of the canal as that least often affected.

From the nature of the circumstances, as regards the seat of the disease, and its insidious onset, it is not possible to know what are the first pathological manifestations of the growth. It can only be assumed that its origin will be much the same as where carcinoma arises on some visible surface. Thus it may commence as a small papilloma or warty growth,

as a surface plaque or a deeper-seated induration, as a fissure, abrasion, or slight ulceration; but in whatever way the disease first manifests itself, sooner or later growth and ulceration become the prominent pathological processes, and we finally have all those later appearances with which we are familiar in the post-mortem room.

It must be remembered that in dealing with carcinoma, wherever it is found, three pathological processes are at work: growth, destruction, and contraction. The growth as seen in the region under discussion manifests itself at the advancing part of the disease—that is to say, it forms prominent edges to the ulcerating surface, and indurates the neighbouring tissues by infiltration. Destruction is seen towards the central part of the disease, where the process may either be molecular disintegration or the separation of large sloughs. This process in its progress rapidly leads to the destruction of parts beyond that of the region attacked. Thus the œsophagus is perforated and any neighbouring cavity or structure opened into. The process of contraction consists in the development of fibrous tissue both within and without the tumour tissue proper. The shrinking of the fibrous stroma of the growth, as also of that developed as the result of inflammatory irritation, gives rise to the narrowing of the canal; and this, together with the projecting masses of the growth, cause all those symptoms of obstruction which form the striking features and characteristics of the disease.

The macroscopical appearances of the diseased part when seen on the post-mortem table are extremely various. A typical example will be that of a mass of growth completely encircling the canal for a variable extent upwards and downwards, and reducing its calibre to a minimum. Ulceration will also be found to a greater or less extent. While then it may be said to be the rule to find a limited circumferential contraction and ulceration, numerous cases occur where the disease is both more limited and more extensive. Thus the disease may extensively invade the wall of the canal and yet not diminish its calibre. The growth may form a mere localised projection into the canal; at other times specimens are met with where more than one spot seems to be separately affected. In many of these there is direct lymphatic connection, the disease travelling along the lymphatic channels

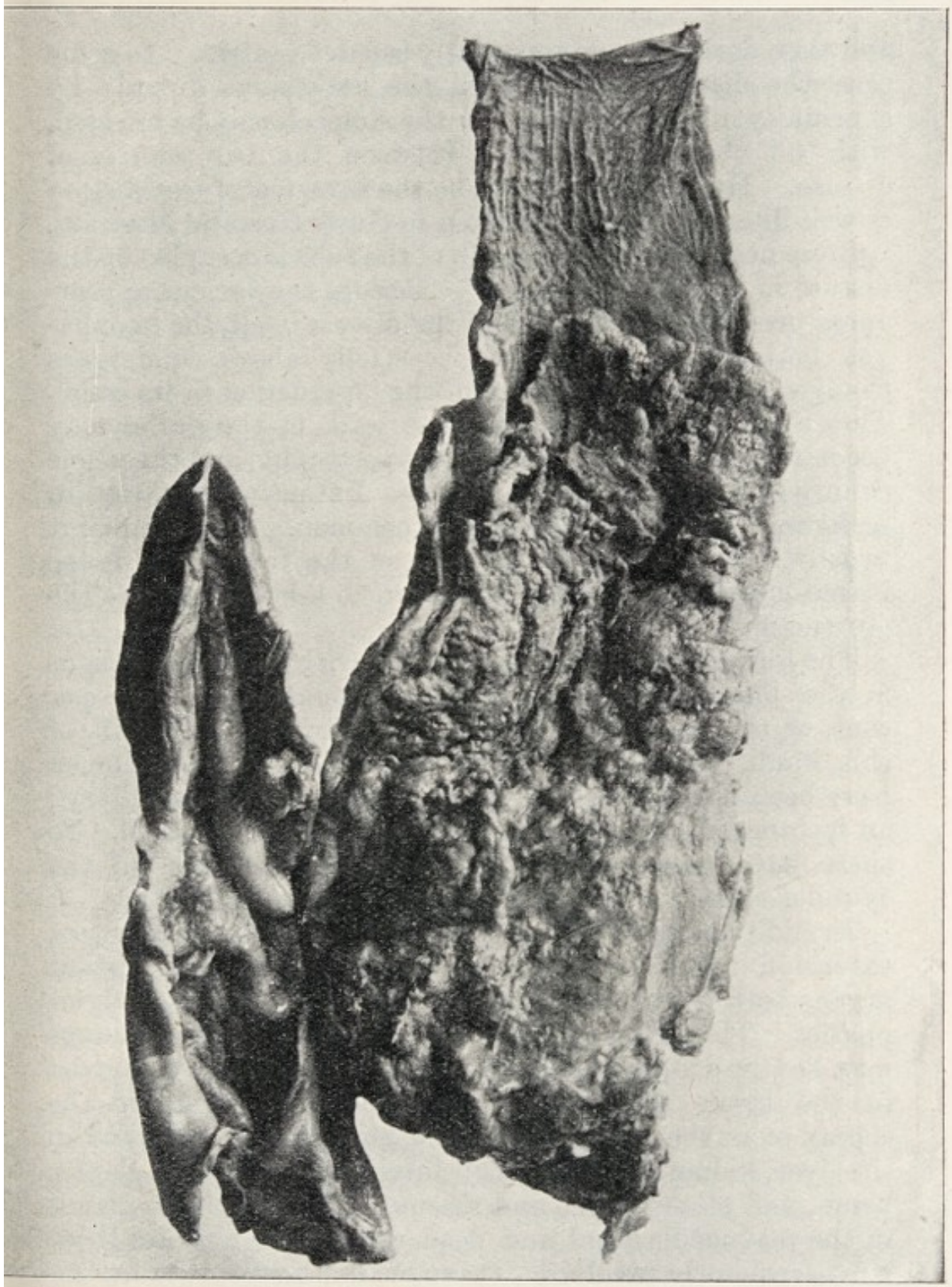


FIG. 7.—CARCINOMA OF ŒSOPHAGUS.—A flat fungating tumour occupies about the lower 4½ inches of the gullet. The mass ends abruptly above, but below presses down against the wall of the stomach, but the latter is not involved. The ring of whalebone, seen below, indicates the cardiac orifice; and the piece above a small perforation which led to gangrene of the lung. (*W.I.M., Glas.*)

and then developing as apparently isolated centres. In some cases the disease extends from the œsophagus directly by continuity into the stomach ; or the stomach may be infected, with no obvious connection between the two centres of disease. How extensive may be the invasion of the disease is well illustrated by a specimen in Guy's Hospital Museum, "where nearly the whole length of the tube is occupied by the disease in its sloughing stage." Besides the various appearances presented by the seat of the disease itself, the œsophagus both above and below, especially above, undergoes changes, as the result mostly of the obstruction in its canal. Thus above the seat of disease the walls of the gullet may become thickened from muscular hypertrophy, and the whole calibre of the canal may be dilated. Extensive dilatation in malignant disease is, however, uncommon. The complaint usually runs a too rapid course, and the food taken is too little for any very marked dilatation to take place above the obstruction.

The form of carcinoma usually met with in the œsophagus is the flat- or squamous-celled epithelioma. Ninety per cent. of the tumours met with are, according to Butlin, of this kind. Both forms of the glandular-celled carcinoma have been met with—that is, the scirrhous and medullary ; an instance also of the colloid form has been recorded. To these have now apparently to be added examples of the cylinder-celled variety, but they are very exceptional.

In addition to the diseased centre itself in the œsophagus, extension takes place into the neighbouring and distant organs both by direct continuity and by means of the lymphatics. Thus by direct extension of the growth the lungs may be invaded, or the heart ; masses of tumour may exist in the tissue surrounding the œsophagus, either in the thorax or in the neck. Secondary nodules may be found in the liver, kidneys, spleen, small intestine, mesenteric glands, bones, and other organs and tissues. The lymphatic glands in the post-mediastinal and deep cervical regions are those most frequently involved. Occasionally, however, more distant glands are attacked. Thus a case is recorded where the glands in both axillæ, and both posterior triangles were enlarged. Various inflammatory lesions from perforations are sometimes found. These may take the form of an acute cellulitis or a localised abscess when the perforation

leads into cellular tissue, or pericarditis or pleurisy if the pericardial or pleural cavities are invaded. When the bronchus or lung is opened into, pneumonia and gangrene are the usual sequels.

Symptoms.—Although not the usual way of describing the symptoms of the disease, and taken exception to by some, it has seemed to me likely to simplify the discussion by dividing them into local and general.

Local symptoms.—These symptoms are connected entirely with the tumour within the canal, and are among the earliest to manifest themselves. Dysphagia is frequently the first symptom which indicates the onset of the disease. The patient's attention is attracted by the difficulty in swallowing certain foods, mostly of a dry, solid consistency. This difficulty slowly increases until it is found that unless the solid food is very thoroughly masticated or freely moistened with fluids it will not pass into the stomach. It descends a certain distance, remains for a few minutes, and is then gulped up. At a later stage solids under any form will not pass, and the patient finds himself forced to limit his nourishment entirely to fluids. Still later, difficulty is experienced in swallowing fluids, and in the latest stage little or nothing can be got to pass the obstruction. It not unfrequently happens that when the obstruction is at its worst a sudden and marked improvement takes place. This, however, is only temporary, and is due to the accidental removal of a portion of the growth, which for a time renders the canal more permeable.

A sense of obstruction is often experienced by the patient. He feels the place at which the food lodges, and is often conscious—to the extent sometimes of suffering pain—of its slow progress past the obstruction. At times a small amount of bleeding may take place from the ulcer, and the patient expectorates blood-tinged mucus. As the obstruction increases there is an inability to swallow saliva, and hence this and the mucoid secretion from the œsophageal glands cause the patient to expectorate constantly, at first a more or less frothy mucus, but later a much more viscid material.

The pain experienced is variable in degree, kind, and situation; at times it is so slight that but little more than a feeling of inconvenience is experienced; at other times its

severity is marked by sharp, shooting, or burning sensation, located behind the sternum, in the epigastrium, or posteriorly between the shoulder blades.

General symptoms.—Prominent among the general symptoms is the progressive and frequently rapid emaciation. Whatever may be the amount of wasting due directly to conditions connected with the growth of the tumour itself, it is largely augmented through the increasing diminution of nourishment which reaches the stomach. This insufficiency of food causes at the earlier stage of the disease a feeling of hunger, but this soon gives place to sensations of faintness. The stomach also suffers from the want of its ordinary stimulants, and fails at last in its proper digestive function, so that not infrequently such food as does reach it remains for some time in an undigested condition. Should vomiting result from these digestive disorders, much pain and inconvenience are experienced. The breath frequently becomes very offensive, due in some cases to the gastric disturbances, and in others to ulceration and sloughing at the seat of the disease. Dryness of the tongue and fauces, with troublesome thirst, are distressing symptoms towards the close. The bowels are constipated.

Excluding complications which will be referred to later, the above local and general symptoms may be taken as examples of those most commonly met with. It will be right, however, to allude briefly to a few modifications of these which occasionally present themselves.

The onset of the disease may be quite sudden. Several cases have now been recorded where the patient while engaged in eating his ordinary meal suddenly encountered difficulty in swallowing a bolus of food; indeed patients have been known to enjoy perfect health up to the period of the sudden appearance of severe obstruction.

Again, dysphagia may never be a symptom throughout the disease, or only make its first appearance when symptoms of perforation arise. While it is usual for food to be almost immediately ejected after being swallowed, it is sometimes delayed in its return, due probably to some dilatation above the obstruction where the food can temporarily lodge. In some cases so little like the ordinary symptoms met with have those been which presented themselves, that a mistaken diagnosis has been made. In a case recorded

by Smith the earliest symptoms consisted of burning pain in the stomach of considerable severity, heartburn, water-brash, and pain in the back and shoulders. The cause was diagnosed as one of cancer of the stomach, but was subsequently proved to be disease of the lower third of the œsophagus. In a case also, reported by Finlayson, aphonia was such a prominent symptom that a diagnosis of advanced laryngeal phthisis with ulceration was first formed. The case subsequently turned out to be one of cancer of the œsophagus involving the left recurrent laryngeal nerve. In another instance the diagnosis was chronic gastritis.

The quantity of mucus expectorated varies within considerable limits, several ounces being sometimes ejected.

Secondary complications.—In the later stages of the disease symptoms not infrequently arise which indicate complications due to some extension of the disease into neighbouring organs and tissues. Thus dyspnœa may arise from pressure upon or invasion of the trachea: a sudden violent fit of coughing arising spontaneously or on any endeavour to swallow fluid, may indicate the formation of a communication between the œsophagus and the main air passages. A sudden hæmorrhage may be due to the opening of a blood vessel; and here it may be remarked that any vessel, whether vein or artery, lying in close proximity to the gullet may be laid open by ulceration. The larger the vessel, the more copious and serious will naturally be the hæmorrhage. Involvement of the recurrent laryngeal on either side, although the left is more frequently implicated, may cause some laryngeal irritation with cough, or complete paralysis of one vocal chord with some aphonia. A rise of temperature with other concomitant symptoms of feverishness, should lead to suspicion of inflammation arising somewhere. This may be of the nature of a pleurisy, a pericarditis, or a pneumonia, in which case the symptoms distinctive of each will soon serve to establish the diagnosis. A fulness or hardness in the neck, with increasing redness and tenderness will denote cellulitis, with the possible formation of an acute abscess. When considerable pain is complained of, this may be due to secondary deposits in the bone.

Diagnosis.—It is not a matter of much difficulty to diagnose a case of carcinoma of the œsophagus when the patient is about the age at which the disease most frequently

appears; when the history is negative—that is to say, when no explanation is forthcoming to account for the onset; and when the symptoms both local and general are in every way characteristic of the complaint. It is not, however, always that even such evidence is deemed sufficient, and something further is done to establish the diagnosis. Although the advisability of attempting to pass a bougie has often been disputed, most surgeons, I venture to think, nowadays would not consider their investigation of the case sufficient without resorting to that practice. Its advantages are threefold. In the first place it serves to confirm the suspicion of some obstruction; in the second it locates the seat of the disease; and in the third it may indicate to some degree its extent. It may be added further that inasmuch as, for all diagnostic purposes, the utmost gentleness is exercised, any appearance of blood after the operation would strongly suggest ulceration; and if accidentally any fragments of tissue should be dislodged, capable of being submitted to the microscope, the diagnosis may be confirmed beyond all doubt. It occasionally happens that the evidence of an obstruction elicited by the passage of a bougie proves to be misleading. Thus it is by no means uncommon to find a certain amount of spasm associated with malignant disease, and when this affects a part of the canal not at the seat of the disease, nor in its immediate proximity, a false conclusion of the true seat of the obstruction may be easily arrived at. Such errors in diagnosis have been reported.

The seat of the disease is often accurately localised by the patient himself. He is conscious of a certain spot where the food seems to lodge, and he is also conscious of certain sensations while the bolus passes the obstruction. Independently, however, of the passage of food, pain is sometimes felt, and its seat correctly localises the focus of disease. On the other hand the patient's feelings must not always be accepted as accurately settling this point, for sometimes the pain is felt at a considerable distance from the affected area: thus it may be felt at the top of the sternum when disease is much lower. A surer means of focusing the locality of the mischief is by auscultation and by using the œsophagoscope. The latter is of most service when the disease is situated in the upper part of the canal, and the former for obstruction anywhere in the thoracic portion. In auscultation, the

patient is made to swallow some fluid, and the ear is applied either directly or by means of the stethoscope to the spine. In this way various sounds may be heard indicative of the fluid passing through a constricted canal. Further, if we remember the fact that the time occupied by the passage of fluids into the stomach is in the normal condition about four seconds, any increase of this period will suggest obstruction. This method of examination, however, is not so easy as it might at first appear, and requires considerable experience except in the most striking cases. The œsophagoscope may prove of more service than for the mere detection of a tumour; thus it may be possible to remove a fragment for microscopic examination. The possibility of determining with any degree of certainty the particular kind of tumour present is doubtful, but a tolerably correct guess can often be made. Thus the course run by a scirrhous carcinoma is usually much longer than that in the more frequently met with epithelioma. On the other hand, the rarer form of medullary cancer runs a rapid course. Again, any fœtor in the breath or in the matter removed either naturally in vomiting or artificially by the bougie will indicate sloughing of parts.

Differential diagnosis.—The distinction between carcinoma of the œsophagus and other diseases simulating it may be considered under two heads. First where the disease, whatever it may be, unmistakably involves the œsophagus; and second, where it is located elsewhere. In the former instance it is usually the condition of obstruction with its pathognomonic symptom, dysphagia, that most prominently calls for consideration and diagnosis. The various conditions which may give rise to symptoms of obstruction may exist within or without the canal. In the latter case the tube is pressed upon by some tumour or swelling, such as aneurysm of the thoracic aorta, spinal abcess, malignant disease of neighbouring parts, &c. In all these cases there is usually but little difficulty in passing a bougie, and the symptoms peculiar to each affection are sufficient of themselves to indicate the real cause of the obstruction. Among the intrinsic affections of the canal may be mentioned stricture arising either from traumatism, syphilis, chronic ulcer, or some spasmodic nerve affection, chronic œsophagitis, paralysis, and simple dilatation.

In the case of obstruction due either to a traumatic or a syphilitic stricture, the previous history of the case in each instance will largely assist in determining the nature of the obstruction. In the case of stricture following a simple ulcer of the œsophagus, there will usually be some history of previous hæmorrhages, taking place at intervals of time too distant from the actual onset of dysphagia to admit of a diagnosis of carcinoma being entertained. In strictures of a spasmodic character, there will usually be some nerve element in the case to excite a suspicion as to its nature, and in addition the passage of a bougie while the patient is under an anæsthetic will prove the absence of any organic obstruction. It is found sometimes that hot water swallowed in the case of simple spasm is at once ejected, while in cancer it is more likely to be retained. A paralytic condition of the œsophagus giving rise to dysphagia is uncommon, and usually found in those whose strength is greatly reduced either from old age or some prolonged exhausting disease. The bougie passes easily, and so excludes the existence of any organic obstruction. Dysphagia from chronic œsophagitis is distinguished with difficulty from that produced by carcinoma. Occurring about the same time of life and in those who are in robust health, the diagnosis has to rest mostly in the progress of the case. Some assistance, however, may be lent towards making a diagnosis by the fact that in the inflammatory condition considerable pain is experienced in attempting to swallow hot or irritating substances; and that in the passage of a bougie great discomfort, if not pain, is complained of. Under careful treatment — by excluding all causes of irritation — rapid improvement ensues, and any further difficulty in coming to a diagnosis is removed. Simple dilatation of the œsophagus is a condition which usually arises early in life. Although accompanied with vomiting after food, the ejection does not usually take place for an hour or two. The comparatively easy passage of a full-sized bougie will serve to prove that the symptoms are not due to real obstruction.

Carcinoma affecting the cardiac end of that organ may narrow the orifice of the œsophagus, through the growth of tumour around it; or it may so deflect the normal perpendicular axis of the gullet as to cause it to form an acute angle with the stomach.

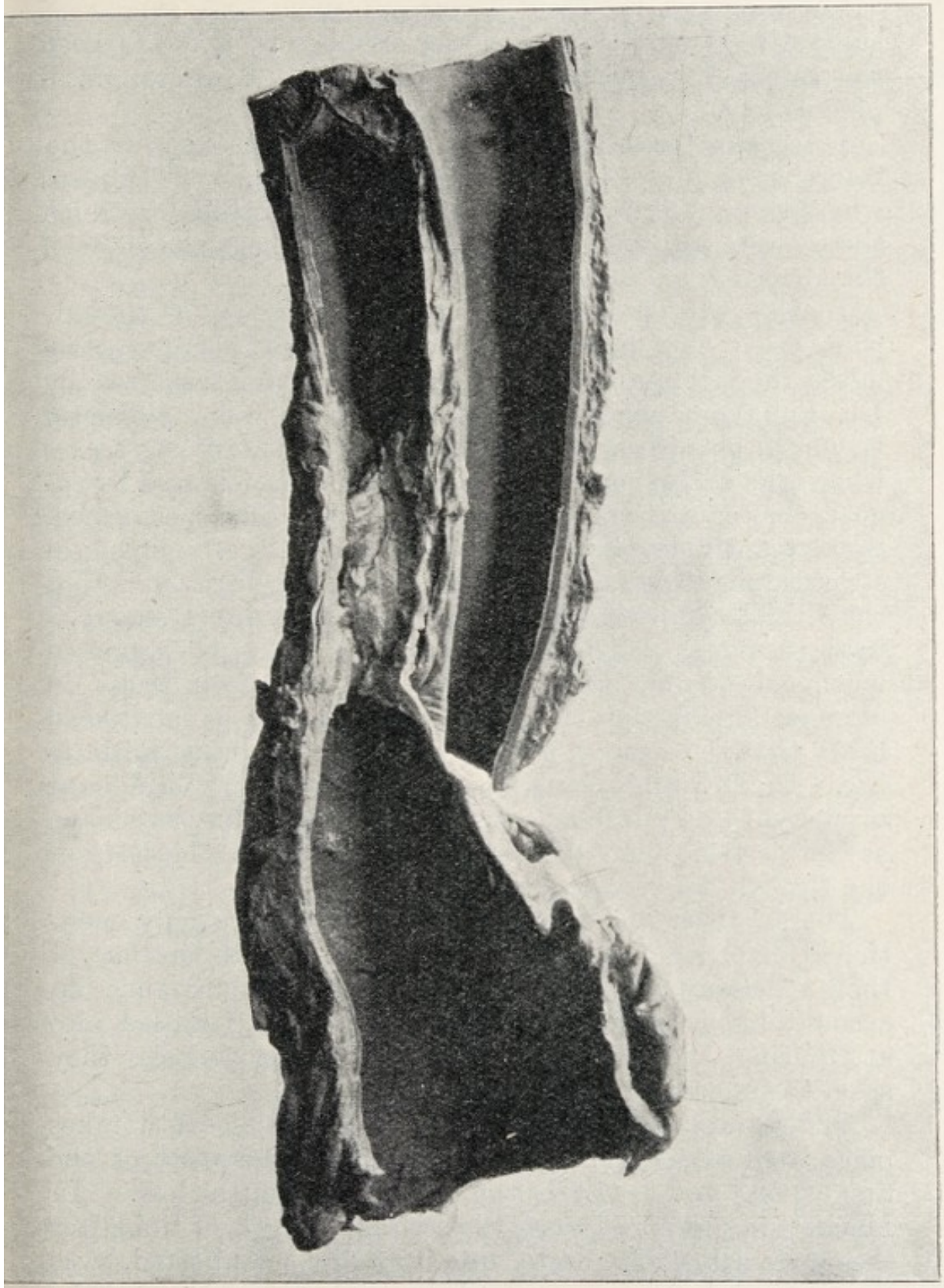


FIG. 8.—CARCINOMA OF ŒSOPHAGUS.—The gullet is involved for about 1½ inch. The lower limit is one inch from the cardiac orifice. The aorta is seen laid open on the right. (*W.I.M., Glas.*)

Carcinoma of the liver produces in some cases symptoms suggestive of obstruction in the œsophagus, and has been the cause of a mistaken diagnosis. (See Spasm of Œsophagus.)

Disease of the œsophagus is liable to be masked, by the reference of the symptoms to adjoining organs. The cases where these difficulties are liable to arise are those in which the symptoms point to disease either of the stomach or of the air passages.

In the case of symptoms suggesting disease of the air passages it not infrequently happens that cough is the misleading symptom, or aphonia, as in a case reported by Dr. Finlayson where the diagnosis made was "advanced laryngeal phthisis with ulceration." Gaucher records a case where the early symptoms were of such a pronounced laryngeal character that tracheotomy had to be performed. Subsequently dysphagia and other symptoms of œsophageal stricture manifested themselves, and it was discovered that the initial symptoms were due to an early involvement of both recurrent laryngeal nerves. In cases of supposed laryngeal trouble the laryngoscope will often assist in eliminating affection of that region. It may be mentioned lastly that the seat of pain may sometimes prove misleading. In Dr. Finlayson's case abdominal pain was a most prominent and puzzling symptom; and was due, as shown at the post-mortem, to a secondary nodule in the body of the twelfth dorsal vertebra.

These varied and exceptional conditions are only mentioned in order to render the surgeon alive to the fact of their existence, so that when somewhat obscure and unaccountable symptoms do arise he may not be misled into attributing them to causes which, on the surface, they seem to suggest.

Prognosis.—In the majority of instances death takes place from exhaustion within a year from the onset of the first symptoms. Often the period is much less. In Mackenzie's hundred cases the average length of life, after the first symptoms were unmistakably manifested, was eight months—the maximum being sixteen months and the minimum five weeks. The many accidents which may happen in the progress of the disease render it impossible to venture upon anything but the merest speculation as to

the length of life. Hæmorrhage, if not at once fatal, must be considered as a grave forerunner of not very distant dissolution. Perforation into the air passage will cause death within a week or two. Barring such accidents, life may be measured by the general physical conditions of the patient. Towards the latest stage of the disease considerable improvement sometimes takes place in the patient's ability to swallow. This is due to some dislodgment of the growth, and is of course only temporary improvement.

Where it is possible to adopt some conservative measures in the way of treatment, life may be considerably prolonged. The question of the total extirpation of the disease is not one which at present it is possible to entertain in regard to prognosis. While operations have been suggested and endeavours made for the excision of the tumour, whether located in the cervical or the thoracic portion of the œsophagus, nothing is yet sufficiently settled to enable any opinion to be expressed either for or against the prolongation of life after any such attempt.

Treatment.—In a disease which is practically incurable the treatment consists in such measures as will most conduce to the prolongation of life and the relief of suffering. It will simplify the discussion of the subject to consider the treatment of œsophageal carcinoma under the four stages into which the progress of the disease may be divided. These are,

(1) Early symptoms of dysphagia, but with ability to swallow solid food. (2) Inability to swallow solids, but ability to take fluids. (3) Aphagia, or total inability to take fluids. (4) Complications such as arise from fistulous communications with air passages, &c.

(1) With comparatively few exceptions—such as those already alluded to, where the onset of the dysphagia is sudden and severe—the condition most frequently met with is that of some slowly increasing difficulty in deglutition. The patient has, as a rule, already learnt the secret of how best to get solids most easily into the stomach. If not previously mixing well the solid with some fluid, he immediately swallows a mouthful of fluid after taking the solid "to make it go." The treatment therefore at this comparatively early stage of the disease consists almost solely in a careful selection of suitable foods. The foods

must be of the most nutritious kind, free from irritating properties, and without such condiments as pepper and mustard. They should also be of such a character and consistency that they can easily mould themselves to the narrowed and distorted passage through which they have to pass. Taken in small mouthfuls, and either well masticated or previously mechanically broken up, a patient will frequently be able to make a good meal, when without such simple precautions but little solid food might be swallowed. The foods which will be found best to subserve these requirements are—among those of a nitrogenous kind—oysters, boiled or stewed tripe, boiled calves' or sheep's head, stewed pigs' and calves' feet, eggs, &c.; and—among those of a farinaceous kind—porridge, arrowroot, boiled sago, ground rice, &c. Occasionally it will be found that cold materials are taken better than warm or hot. As the time approaches when even these bland foods are beginning to pass with difficulty, the question of instrumentation arises. Now will be the time for the systematic passage of bougies. Twice a week, or oftener, a bougie should be passed. Such a practice will serve to extend the time during which a patient will be enabled to continue taking solid foods. When, however, this means fails, we have to face the second stage, that of total inability to swallow solids.

(2) Patients who are reduced to depend solely upon fluids for nutrition rapidly emaciate, and the question of treatment no longer turns upon the kind of nourishment to be administered, but upon certain considerations connected with the question of operative interference.

If something is to be done the choice lies between intubation and opening the canal below the obstruction. My own opinion is, that if gastrostomy is to be performed, now and not later is the proper time for it. The method which I have employed in my last three cases, and which I will describe later, has proved so advantageous that I do not hesitate to press upon my patients the subsequent good to them of undergoing the operation at this period rather than later

If the surgeon selects intubation it should be performed, as described by Symonds,* in the following way:

* *Lancet*, 1889, vol. i. p. 622.

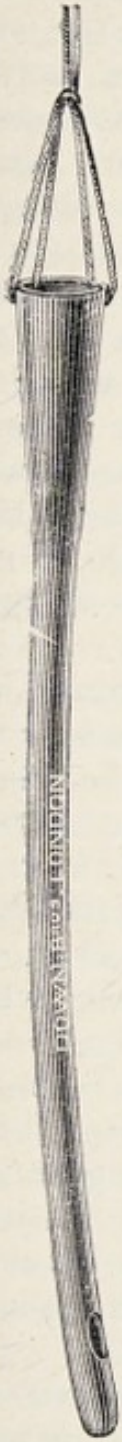


FIG. 9.—Symonds's Short Tube for Cancer of the Œsophagus.

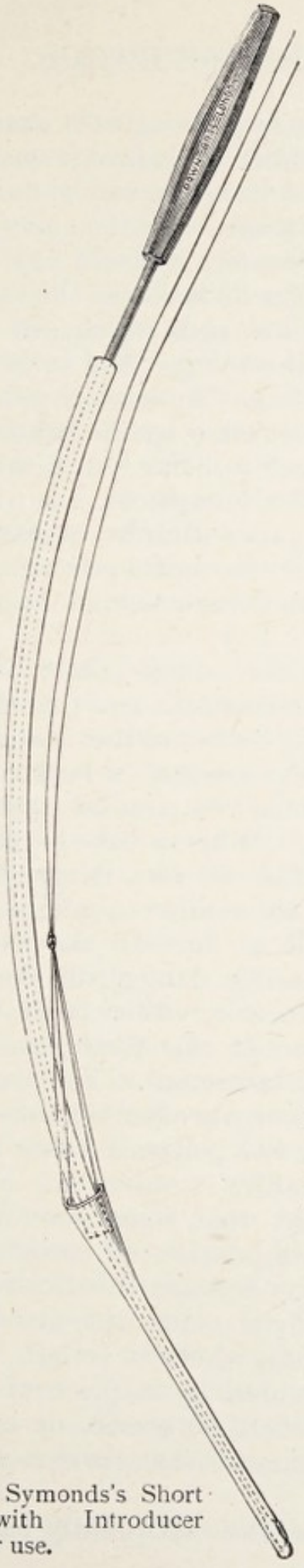


FIG. 10. — Symonds's Short Tube with Introducer ready for use.



FIG. 11.—Symonds's Short Tube, *in situ*.

A. Upper aperture of larynx; B, œsophagus laid open from behind; C, silk thread by which the tube is retained in position and withdrawn; D, wide upper end of the tube above the stricture; E, narrower lower part of tube below the stricture; F, cardiac end of stomach.

"First ascertain by a large bougie the exact position of the stricture—*i.e.*, the number of inches from the teeth; then pass the largest conical bougie possible, and judge by this the size of the tube to be used. Fitting now the introducer" (made of whalebone and enclosed by a gum elastic sheath), "mark on it the distance to the stricture, or make a knot in the silk" (the cords which are attached to the upper dilated part of the tube), "and insert with the head thrown back. When it has entered the stricture send the tube down slowly, till arrested by the funnel, and withdraw the introducer. The silk being kept taut, the tube is kept in contact with the introducer. . . . It is essential to avoid *hurry* and *force*, to withdraw at once if there be a spasm, and to keep in the *median line*. The silk is now tied round the ear, and fixed behind by a piece of strapping."

The time during which a tube should be retained will depend upon various circumstances. After a week or ten days it will sometimes be found that the first tube can be removed and replaced by another of larger calibre, and this process may be continued at similar intervals until the largest size is reached. When a tube of this size has been kept in place for a week or two, it may be removed, and the patient allowed to swallow some solid food, which otherwise he is unable to do. In the use of these short tubes there is the possible danger of the tube becoming disconnected from its cords, either from the latter being severed by the friction of the teeth, or breaking in any forcible endeavour at extraction. The narrower the tube used, the greater the care needed regarding the nature of the food to be swallowed. In all cases it must be of a perfectly fluid character.

It may be added here that some amount of success has been attained in the dilatation of malignant stricture by the use of laminaria. Senator, of Berlin, has used this form of tent. It is fixed on to the end of a bougie and passed into the stricture, where it is left for half an hour or longer. Being secured by a piece of silk it is easily withdrawn. The method of treatment is, however, more suitable for non-malignant cases, where it will be more fully referred to.

(3) In hospital practice it frequently happens that not a

few of the patients who present themselves for admission are cases of aphagia or complete inability to swallow fluids. In these instances the patients are much emaciated, greatly reduced in strength, and show signs of sinking from starvation. When thus first seen it will often be found impossible to pass the smallest bougie, and no repeated attempts should be made for a day or two. The patient should be confined to bed, kept warm, and fed by nutrient enemata containing opium. To quench thirst a little ice should be sucked, but warm water may be given by rectal injection. On the second or third day a renewed endeavour should be made to pass a bougie; but prior to the attempt subcutaneous injections of morphia should be given and the patient placed under the influence of an anæsthetic. If a bougie can be passed, then further dilatation may be effected, until a tube can be introduced and the treatment by that method continued. Failing, however, to obtain any passage past the obstruction, the only alternative is gastrostomy if the disease is situated in the thoracic portion of the canal, or œsophagostomy if the disease is sufficiently high up to admit of the opening being made below it.

(4) While I have placed as a fourth stage of the disease the existence of complications through the extension of the growth to neighbouring parts, it must be remembered that these may arise at any period in its progress, although more frequently appearing after the disease has lasted for some time. Whether, however, arising early or late the treatment will consist either in the use of the long tube permanently retained or in the performance of gastrostomy. When a choice exists, those surgeons who have had experience of the former measure will select it in preference to the latter, and gastrostomy will only be adopted as a *dernier ressort*. The "long" tube is of most service in cases where ulceration has taken place into the pleural cavity, lungs, bronchi, or trachea, and in some cases where the disease is situated so high up that a "short" tube cannot be worn. Again, where there is reason to believe, from the offensiveness of the breath and other symptoms, that the disease is extensive and that the wall of the œsophagus is both sloughing and thin, the "long" tube will prove of value.

The "long" tube passes from the stomach out through

the mouth or nostril. If no inconvenience is associated with its retention it may be kept in for lengthened periods. As all food is injected into the stomach through the tube, there is an absence of those troublesome symptoms which would arise from the escape of material through any fistulous opening into the air passage and elsewhere. If for any reason, such for example as undue irritation, it be found impossible to retain the tube permanently, it must then be used simply as a feeding tube, to be removed and introduced as required.

While special "long" tubes can be obtained, it is of service to the surgeon to know that for all practical purposes and in cases of urgency a very simple device will suffice. These are Symonds's directions for the construction of a "long" tube "in a few minutes": "Take a piece of red rubber drainage-tube with a thin wall and a wide bore and about eighteen inches long. Cut one end obliquely and sew it up, thus obtaining a conical end; next cut a large eye in the tube about an inch from the extremity; or two openings may be made. To prevent the introducer catching in the point, fill up the interior where stitched with a plug of cotton wool. Oil the exterior of the tube and introduce thoroughly. Insert this with the whalebone introducer; . . . the outside diameter of the tube need not be more than a No. 12 catheter."

One of the most troublesome objections to the use of a permanent long tube is the irritation, resulting sometimes in ulceration, which takes place on the posterior surface of the cricoid, due to the constant pressure of the tube on that part. This is, however, reduced to a minimum by using as soft and flexible tubes as possible.

I have left for separate and fuller consideration the question of operation. The œsophagus, like almost every other region of the body, has not escaped the surgeon's endeavour to totally extirpate the disease. Hence scattered cases are found where the operation of removing portions of the œsophagus has been performed. Originally suggested by Billroth* in 1872, and successfully performed by him on dogs, it was first apparently executed on man by Kappeler; but not till 1878 was the operation successfully carried out

* *Archiv für Klin. Chir.* 1872, Bd. xiii. p. 66.

by Czerny, who in a private letter to Morell Mackenzie stated that the patient lived for a year after the operation. In this and other instances the disease was located in the cervical portion of the canal, but a bolder procedure has recently been suggested by Nassiloff* of excising the part when situated within the thoracic region; no case attended with success has, so far as I can ascertain, been recorded.

Other operative measures dealing directly with the disease are internal œsophagotomy, and cauterisation or excision with the scissors when the disease is situated high up. By the aid of the œsophagoscope projecting masses of the growth have been removed so as to allow of the passage of a tube. Internal œsophagotomy has been performed and has given relief, but it is not a method of treatment to be recommended.

The two operations worthy of most consideration are those of œsophagostomy and gastrostomy. Both have the same object in view—to obtain an artificial entrance into the stomach for the administration of nourishment. The former operation is performed when the disease is located high up, and the opening in the œsophagus being thus below the seat of obstruction, a feeding tube can be easily passed from the wound into the stomach. Occasionally the œsophagus is opened above the level of the disease, the object then being to facilitate the passage of a tube which otherwise would be conducted with pain or difficulty through the natural orifices.

The operation of gastrostomy is by far the more frequently adopted measure, and considerable differences of opinion exist among surgeons as to the period when it should be performed. As already indicated, permanent tubage has to some extent replaced this operation in the hands of some surgeons, and those who practise this more conservative measure do not consider the question of opening the stomach till the latest stage of the disease. On the other hand, those who advocate gastrostomy do so at a much earlier stage. If at any time the risks of the operation can be considered grave, they are certainly least so when the patient is not greatly reduced in strength. Contrasting,

* *Annual of the Universal Medical Sciences*, 1889, vol. iv. G—38.

however, the operation successfully performed with the alternative of permanent tubage, it must be confessed that in the majority of instances the patient with a tube in the œsophagus is, in various ways, in a more comfortable position than one with an artificial orifice in the stomach. If the choice lie with the patient, it is more than probable that the tube will be selected in preference to the operation.

Sarcoma.—Except as histologically distinguished from carcinoma, sarcoma has no particular clinical features peculiar to it. The few cases of the disease that have been recorded were mostly mistaken during life for carcinoma, and it has been only after death and as the result of careful microscopical examination that the true nature of the disease has been discovered.

CHAPTER VIII.

NON-MALIGNANT OR CICATRICIAL STRICTURE.

The stenosis which follows from malignant disease, and which has just been discussed, differs in two important particulars from the affection now to be dealt with. In the former instance the contraction of the canal is associated with progressive growth and destruction of tissue, while in the latter the sole pathological feature is the cicatricial contraction. Another point of distinction rests in the nature of the cause. While in malignant disease we are ignorant of what is the origin of the process which leads to obstruction, in the case of purely cicatricial stricture we know it to be due to some definite influence.

Etiology.—Many of the causes which give rise to cicatricial contraction have already been alluded to, but the subject of stricture was only briefly indicated as a possible sequel to the affection. The causes already described are traumatism, chronic œsophagitis, simple ulcer, syphilis, and tuberculosis. To these may be added such rarer causes as smallpox, repeated attacks of vomiting, the suppression of

certain discharges or skin eruptions, prolonged spasm, and possibly rheumatism and gout.

Stenosis from traumatism.—In various ways injuries to the œsophagus, received externally or internally, may lead to stricture. Thus it may be as the result of chronic inflammation; of destruction of tissue at the time of the accident; or of ulceration taking place subsequently. By far the most frequent cause is that which results from ulceration. This is usually effected in one of two ways. Either it is due to prolonged impaction of a foreign body, such as a bone, a fruit-stone, or other such sharp and irregularly shaped bodies, or, as is more frequently the case, it results from swallowing some caustic alkali or acid.

Ulceration which results from an impacted body is, of course, limited to the seat of impaction. The depth and circumferential extent of the process vary according to the size and general nature of the impacted body. The form of stricture which results will similarly be limited. The exception in this class of cases is where endeavours at extraction, whether successful or otherwise, have led to injuries of other parts of the œsophagus; so that, instead of one stricture two or more may be met with.

Strictures which result from swallowing acids, caustic alkalis, or boiling fluids may be single, but are not infrequently multiple; and even when single they are usually much more extensive and much more irregular than those following other forms of traumatism. When it is remembered how all parts of the canal are subjected to the cauterising influence of the fluid, it will at once be gathered how extensive may be the destruction of tissue and subsequent ulceration, and how irregular its distribution. There are, however, parts more frequently and more severely attacked than others. These are the more constricted and rigid portions of the canal, such as opposite the bifurcation of the trachea, at its commencement near the cricoid cartilage, and at its termination near the cardia. The following table of twelve cases compiled by Weinlechner,* where the seat of stricture was accurately determined at the post-mortem, are also interesting as showing the extent and number of strictures which may be present.

* *Wiener Med. Wochenschrift*, 1880, p. 33

In 8 cases the thoracic part was alone implicated.
In 1 case there were three strictures.
,, 2 cases there were two strictures.
,, 5 cases there was one stricture.
In 2 cases both thoracic and cervical regions were implicated.
In 1 the cervical stricture was opposite the cricoid.
,, ,, ,, 4 cm. below the cricoid.
In 1 case the cervical part was alone involved.
In 1 case the entire œsophagus was moderately affected.
12

Stenosis from chronic œsophagitis.—Rare as is chronic œsophagitis, still rarer is the sequel to it—stenosis. The kind of stricture which results from this affection resembles that which follows on chronic urethritis. The inflammatory process leads to a thickening of the mucous membrane and submucous tissue, with changes extending sometimes into the muscular coat. The parts thus thickened by infiltration and new-formed tissue contract and lead to a narrowing of the canal.

Stenosis from simple ulcer.—The variety in form of this kind of ulcer naturally entails a corresponding variety in the strictures resulting from it: thus a cicatricial ring may be produced, or simply a fibrous band coursing for a variable extent transversely or in some other direction.

Stenosis due to syphilis.—Within recent years numerous cases have been recorded of stricture of the œsophagus due to syphilis. Inasmuch as gummata have been found in the lining wall of the gullet, it is only reasonable to suppose that, as in other parts of the body, they may break down and give rise to ulceration, which in the process of healing will lead to stricture.

There is little that can be said to be specially characteristic of this kind of stenosis. In almost all instances the diagnosis of the cause has rested either upon an unmistakable history of syphilis some years previously, or the existing evidence of such an attack in lesions in other parts of the body.

Stenosis from tuberculosis, &c.—Stenosis arising from other causes than those just described is so extremely rare that it needs little more than a passing notice.

Occasionally cases occur where no cause can be ascribed; the symptoms have come on insidiously, and finally there is well-marked evidence of a cicatricial stenosis. In some of

these cases the patients have been subjects of rheumatism or gout

Under the heading of "Simple Stenosis" cases have been recorded where it was found that the stricture consisted in a localised narrowing of the mucous and submucous lining of the canal, without any evidence of traumatism or cicatricial tissue.

Symptoms.—The symptoms of stricture of the œsophagus dependent upon any of the causes above mentioned are almost solely connected with progressive dysphagia. At first there is the difficulty of swallowing solids. The patient finds it necessary to moisten the food with fluid, or after each effort at deglutition to swallow a mouthful of liquid to make the bolus go down. As the canal narrows solids can no longer be taken, and only liquids will pass, till finally in the severest cases nothing can be got into the stomach past the constriction. Concomitant with the difficulty in deglutition is the occasional return of the food by the mouth. The patient vomits at variable intervals of time after taking something that will not pass through the stricture. If the stricture is situated high up, vomiting takes place almost immediately; while if lower down, and especially if associated with some dilatation of the canal above, the return is delayed. Independently of taking food, the patient occasionally "hawks" up quantities of clear viscid material, which is saliva that has been swallowed mixed with the mucoid secretion from the lining membrane of the œsophagus, both having collected and lodged above the seat of obstruction. The gradual diminution in the amount of food taken into the stomach leads to progressive emaciation, with, in the earlier stage, the painful feeling of hunger, and in the later, that of increasing weakness. Pain, not extending beyond a feeling of discomfort in some cases, is usually experienced in the region of the stricture, and felt either about the epigastrium, behind the sternum, or between the shoulder blades. Occasionally the pain is referred to more distant parts. The smallness in quantity of the food which enters the stomach causes gastric disturbances and troublesome constipation.

Differential diagnosis.—The differentiation of the symptoms of obstruction due to cicatricial stricture of the œsophagus from those dependent upon malignant

disease, upon spasmodic affections, and upon external pressure, will mostly depend upon the relative distinctness of the other associated symptoms. The age and sex of the patient, in the absence of any history of traumatism or syphilis, will reasonably suggest that symptoms of obstruction in a man over forty years of age are due to malignant disease; and, further, the presence of any blood, either in the ejecta or on the bougie after its use, will tend to corroborate the opinion. The mere passage of a bougie will also serve in many cases to eliminate obstruction due to spasm and pressure from without. The instrument being passed when the patient is under the influence of an anæsthetic, there will be an absence of any sensation of "grip," such as is experienced in a purely cicatricial stricture. Where obstruction is due to pressure from without, such, for instance, as occurs in some cases of aneurysm, there will probably exist other symptoms peculiar to the disease itself. Cases will occur where the symptoms at the time are not sufficiently distinctive to admit of a definite diagnosis being made. The progress of the case will, however, tend sooner or later to clear up any obscurity.

Diagnosis.—To determine the cause of the stricture, its seat and particular nature are points of considerable importance in connection with the proper treatment of the case. The history of the case should in most cases lead to a correct diagnosis of its cause. Thus no difficulty will arise in this respect when a history of swallowing some caustic fluid is obtained, or when there exist about the body secondary or tertiary scars the result of some previous attack of syphilis. Again, the history of a foreign body impacted for some time, and any difficulty connected with its extraction, will leave little doubt as to traumatic origin. Strictures due to other simple causes will not be so easy to determine. Previous moderate attacks of hæmorrhage might correctly indicate simple ulcer. The rarer causes which have been given, such as chronic œsophagitis, tuberculosis, &c., can, as a rule, only be matters of conjecture.

The value of knowing the cause of the stricture rests upon the light that is thrown upon its nature. Thus the stricture which results from swallowing some caustic fluid

will be probably irregular, possibly multiple, and located usually either in the region of the cricoid cartilage, opposite the bifurcation of the trachea, or near the cardia. Strictures, on the other hand, which result from an impacted foreign body, a simple ulcer, or syphilis, will be single, possibly involving only a part of the circumference of the canal, and consist in longitudinal, oblique, or transverse fibrous bands. When a sound can be passed, some of the opinions formed from a knowledge of the cause may be corroborated or possibly extended. Thus, by using a sound with an olive-shaped ivory or metal end, the "olive" will detect, both in its progress inwards and in its withdrawal, whether there is more than one stricture, the probable length of a stricture, and its calibre and tightness. Where there is reason to suspect a bridle stricture, hemispherical-headed sounds have been used to discover on which aspect of the wall the stricture is situated. By rotation of the head it is felt on which side the "hitch" takes place.

Prognosis.—The ultimate issue of any case will depend largely upon the cause which has led to the stenosis. It has already been shown that the nature of the stricture varies considerably with the cause. The worst form is that which follows upon the imbibition of some caustic fluid; and it may be said that the sooner the symptoms of obstruction arise after the subsidence of those which follow the immediate injury, the worse is likely to be the stricture. In this class of cases almost the only hope of a successful issue rests in the possibility of dilating the stricture simply, or by some operative means, and keeping it dilated; otherwise death by gradual starvation must be expected. Such cicatricial strictures as arise from ulcers resulting from an impacted body, syphilis, tuberculosis, &c., are mostly dealt with successfully.

The want of accurate knowledge regarding the nature of a stricture in all its aspects must always render any positive prognosis very difficult, if not impossible. Thus it is always possible that cicatrisation may not be circular, only "island-like." In such a case the canal will contract to a certain extent and remain so, the patient being able to swallow fluids but incapable of taking solids.

Prognosis in regard to treatment even in its simplest form, such as consists in the passage of a bougie, is not free

from danger. Weinlechner* gives seven cases where after attempts to pass a bougie a rapidly fatal result ensued. The post-mortem revealed no gross lesion. In three cases death resulted from pyo-pneumothorax, and in four from empyema. Billroth, in commenting on these cases, believes that septic matter was carried at some time by the bougie through the wall of the œsophagus into its surrounding cellular tissue, and there soon gave rise to an acute inflammation. What success, on the other hand, may follow this mode of treatment is instanced by the same author in a case which he recalls where, ten years after passing the bougie, there was not the least difficulty in swallowing. The apparently simple operation of internal œsophagotomy is not free from untoward results. Thus Sands † mentions several cases where accidents have happened. In two cases peritonitis was set up, the result possibly of direct injury to the stomach; in two others hæmorrhage, and in one empyema.

The risks in connection with such operations as gastrostomy are comparatively slight and need not be further considered. Little danger appears to be connected with treatment by electrolysis.

Treatment.—By no other measures than those which may be said to be strictly surgical can we treat cicatricial stricture of the œsophagus. Iodide of potassium given internally will aid in syphilitic cases, but with this exception all methods of treatment are based on some kind of mechanical procedure.

The means at our disposal are—(1) Gradual dilatation, (2) forcible or rapid dilatation, (3) electrolysis, (4) internal œsophagotomy, (5) external œsophagotomy, (6) œsophagostomy, (7) gastrostomy.

(1) **Gradual dilatation.**—This method may be performed in one or two ways, either (A) from above through the mouth, or (B) from below through an opening in the stomach.

(A) *Through the mouth.*—Whatever may be the cause of a stricture, and whatever its form, no case will escape a preliminary endeavour being made to treat it by this

* *Wiener Med. Wochenschrift*, 1880, p. 113.

† *New York Med. Journ.* 1884, vol. xxxix. p. 533

method. It is usually owing to some failure in attempts made to dilate in this way that one of the other methods is resorted to.

As in cases of urethral stricture, it is wise to commence with a large-sized bougie, not so much with the object of passing it, but in order to ascertain the exact seat of obstruction. This knowledge gained, a medium-sized instrument may then be tried. If with the most careful pressure it does not enter, an instrument of some two or three sizes smaller should be used. Once the stricture is passed, it is well, if the patient can bear it, to retain the bougie within the constriction for some minutes, or indeed as long as can be endured. Considerable difference of opinion exists with regard to the subsequent treatment of the case: whether a bougie should be passed daily or at greater intervals; whether a few days should be spent in passing the same instrument, or whether a larger size should be attempted on each occasion. Rather than lay down any definite rule, it would be wiser to be guided by the nature and behaviour of the case itself. If a stricture is very tight, and the parts are very sensitive to the passage of a bougie, the progress of the treatment should be slow; and, *vice versa*, the more tolerant the parts and the less resistant the stricture, the more frequent may be the passage of the instrument, and the larger its size at each introduction.

The retention of a bougie in a stricture tends to dilate it, just in the same way as the retention of a catheter in an urethral stricture. Hence a good plan is to pass a tube as soon as possible, retain it, and feed the patient through it. A short permanent tube has been employed with success.

No case should be deemed intractable to this the simplest method of treatment, until several endeavours have been made at variable intervals of time. After the first failure, the patient should be kept in bed and the most careful attention devoted to the diet; and if the condition of the patient will admit, the parts should be kept at complete rest, by the administration of all food *per rectum*. By such means any co-existent spasm may be relieved, and the stricture thereby conquered. (For directions regarding the passing of bougies, see Operations on the Œsophagus, chap. xii.).

(B) *Through the stomach.*—This mode of treatment may be adopted in those cases of irregular and multiple stricture, the result of imbibing some caustic fluid, where the patient can swallow liquids, but no bougie can be passed from above. Gastrostomy is first performed, and after the establishment of a gastric fistula, the patient is made to swallow a shot to which is attached a silk thread. This can be brought out by the gastric opening, and by its means tubes or bougies introduced and gradual dilatation effected.

Gastrotomy, however, and not gastrostomy, has been performed, the opening into the stomach being closed after the first bougie was made to pass from above downwards through the stricture.

(2) **Forcible or Rapid dilatation.**—This method may also be performed either (A) from above through the mouth, or (B) from below through an opening in the stomach.

(A) *Through the mouth.*—There are various methods by which this may be performed.

(*a*) *With ordinary bougies.*—In adopting this method the same procedure is made use of as in the rapid dilatation of an urethral stricture. One bougie is made to follow the other until the stricture has been forcibly stretched or burst to the required extent.

(*b*) *With railway catheters.*—This method resembles that just described, except that the first bougie which is passed through the stricture is retained and not withdrawn. This is used as a guide for the passage of a series of catheters with terminal openings. Over the bougie the smallest catheter is first slipped, and guided by it to and through the stricture. This is then withdrawn, and a size larger run on, the process being continued until the requisite amount of dilatation is acquired.

(*c*) *With sea tangle, tupelo-wood dilators, or laminaria tents.*—This appears a useful way of dilating when the passage of bougies causes much pain or bleeding. These materials swell up in the presence of moisture and so dilate the part in which they lie.

(*d*) *With specially devised instruments.*—Of all the rapid methods of dilatation, that effected by an instrument inserted within the stricture and then expanded is the most forcible and the severest. The treatment resembles that of dilatation of an urethral stricture with a Holt's dilator. This method

has been successfully carried out, but it is not one to be commended.

(B) *Through the stomach.*—The cases which will fall to be treated by this method will be those where it is found impossible to pass through the stricture from above. A gastrotomy is first performed, and the orifice of the œsophagus sought for with the forefinger. A dilator is then passed into the œsophagus through the guidance of the finger, and gently pressed upwards through the stricture. When well within the constricted portion it is opened to its full extent and moved up and down three or four times before withdrawal. The stomach is then closed, and lastly the abdominal parietes. Loreta,* who has performed this operation three times successfully, states that he opens the dilator to the extent of five centimeters (2½ inches). In his first case the patient swallowed a good meal six hours after the operation.

(3) **Electrolysis.**—This mode of treatment has developed considerably within recent years, and, to judge by the large number of cases now recorded, would appear to be both successful and free from danger. Fort† is reported as having cured seven out of nine cases in a period of from nine to thirty days. In one case,‡ where the stricture was situated two inches above the cardia, four sittings overcame the obstruction.

The advantages of this method of treatment would appear to be in the greater rapidity with which, as a rule, dilatation is effected as compared with the results of gradual distension by bougies; and in a less tendency to recontraction. The treatment is, however, usually combined with the passage of bougies.

This method cannot be used when the stricture is impermeable to any instrument. (For directions regarding the practical application of electrolysis see chap. xii.)

(4) **Internal œsophagotomy.**—This may be performed in one of two ways. Either (A) from above through the mouth, or through an opening in the œsophagus (external œsophagotomy); or (B) from below through the stomach.

* *Brit. Med. Journ.* 1885, vol. i. p. 374.
† *Journal of Laryngology and Rhinology*, 1890, vol. iv. p. 119.
‡ *Ibid.* 1889, vol. iii. p. 249.

(A) *Through the mouth.*—This is the usual way, and is performed only on such strictures as are not too tight to prevent the introduction of the œsophagotome. It is not a method of treatment in much favour with English surgeons, but has been practised more frequently in France, where it was originally introduced. So many disasters have resulted from the cutting of strictures that the method has not attained to any favour. As already indicated,* pleurisy, empyema, pneumonia, and other inflammatory mischief have followed the operation. The cases most suited for this treatment are those where the obstruction is due to a localised fibrous band. The œsophagotome is passed beyond the constriction, then expanded and withdrawn, so dividing the stricture in its passage outwards.

For the operation when performed through an opening in the neck, see under External Œsophagotomy.

(B) *Through the stomach.*—The same reason applies for opening the stomach to perform internal œsophagotomy as in the case of the passage of bougies—that is to say, the stricture is impassable from above through the mouth.

To avoid the dangers of sepsis instanced above, Meyer has proposed a method of disinfecting the œsophagus by the preliminary combined performance of gastrotomy and external œsophagotomy. (See below.)

(5) **External œsophagotomy.**—This operation implies either a division of the stricture from without, as in the somewhat similar operation of external urethrotomy, or the temporary opening of the œsophagus above the stricture for the purpose of facilitating the passage of bougies or œsophagotomes. The former of these uses of the operation has but rarely been practised. The second use of the operation, to facilitate the passage of bougies, has been much more frequent. It has been found that when failure has attended any endeavour to introduce a bougie by way of the mouth, the stricture has been overcome by introducing it through an external opening in the neck. The reason for this is that the course is more direct, the bougie not having to follow the pharyngeal curve from the mouth. Another advantage also exists in the possibility of retaining the bougie for a longer time within the stricture, such retention considerably facilitating the subsequent and easy passage of larger sizes.

* Page 64.

External Œsophagotomy in conjunction with either gastrostomy or gastrotomy has comparatively recently been successfully adopted by Abbe* for carrying out a special method of dividing the stricture. A very fine conical gum-elastic bougie is passed upwards through the stricture. To its end is attached a piece of heavy braided silk. After being drawn through, it is pulled backwards and forwards in see-saw manner, and in so doing the stricture is rapidly divided.

Eklund† has made use of an external œsophagotomy for the internal division of a stricture. He succeeded in introducing through the opening Maisonneuve's urethrotome and divided the stricture. In order to combat the septic after effects of internal œsophagotomy Meyer‡ has made the following suggestion. Gastrotomy and external œsophagotomy are first performed. "Before starting the internal incision, irrigate the œsophagus from the fistula in the neck downward with Thiersch's solution or a solution of permanganate of potassium, allowing the water to pass out of the gastric opening and during a sufficiently long time, to be sure that this portion of the canal is thoroughly disinfected. Also carefully wash the stomach from below. (This preparatory treatment may be repeated during a number of days.) Push an iodoformised sponge, or a pad of iodoform gauze on a thread, into the upper portion of the œsophagus, between the opening in the neck and pharynx, so as to guard against the descent of the secretions of the mouth. Then do internal œsophagotomy under constant irrigation from the wound in the neck downwards. Continue the same after the operation is finished. The water will run into the stomach and readily escape through the gastric fistula. Finally pull an iodoformised sponge, or ball of iodoform gauze, with the help of a bougie and thread, through the gastric opening and the cardia into the lower end of the œsophagus. This will prevent regurgitation of the contents of the stomach in the subsequent direct feeding through the abdominal opening."

(6) **Œsophagostomy.**—This operation is only possible when the stricture is situated sufficiently high in the neck

* *Annals of Surgery*, 1893, vol. xvii. p. 489.
† *Annual of the Universal Medical Sciences*, 1890, vol. iv. F—32.
‡ *New York Med. Journ.* 1892, vol. ii. p. 561.

to admit of the opening into the gullet being made below it. The object of the operation is twofold. In the first place it admits of the patient being fed, and in the second it gives access to the stricture above for any treatment that may be attempted. It is of course limited to such strictures as are impermeable.

(7) **Gastrostomy.**—This operation, essentially for the purpose of feeding a patient, is usually adopted only in extreme instances. The patient is generally much run down, and the stricture one which cannot be passed. Under these circumstances the only hope rests in opening the stomach and creating an orifice for the introduction of food. Such a measure as this is of course only palliative, but the rest given to the strictured part of the gullet may admit subsequently of dilatation being effected. It has been shown above, however, that gastrostomy may be performed directly with the object of treating the stricture: that through the temporary gastric orifice bougies or œsophagotomes can be introduced.

CHAPTER IX.

PARALYSIS AND SPASM.

Paralysis.—Cases of this kind are rare, and are not likely in the first instance to come under the surgeon's observation. The affection is not infrequently associated with some other neuropathic symptoms, and for this reason the cases are regarded as medical rather than surgical. It is only when the symptom of dysphagia predominates and other manifestations are but slightly observable that the surgeon may be called upon to make a differential diagnosis.

Etiology.—The motor and sensory supply of the œsophagus being through the vagi, and the latter taking their origin from the medulla, any paralysis of the gullet must be effected in one of three ways. Either the origin or roots of the nerves must be involved; or the trunks implicated,

somewhere between the medulla and the canal; or the muscular wall or mucous membrane so affected that it will either not receive or not transmit impulses.

Considering first such causes as may affect the roots of the nerves, any lesion in the pons or medulla may cause paralysis, or even pressure upon the region communicated from some more distant part. The commonest of these lesions is that due to chronic inflammation such as is met with in glosso-labiolaryngeal palsy and more rarely in the course of lateral sclerosis or locomotor ataxia. Another lesion is hæmorrhage.

Implication of the vagi in their course from the brain to the gullet may be reckoned as the rarest of the causes which lead to paralysis.

Affection of either the muscular tissue or mucous membrane of the œsophagus is said to afford instances of this condition. It is difficult, however, to say whether it is these tissues which are at fault, or whether it is the result of certain specific influences acting directly upon them or indirectly, through the effect of these influences upon the nervous system. The diseases here implied are those which may be termed general or constitutional; such, for instance, as partial or complete paralysis occurring in the course of diphtheria, lead poisoning, syphilis, and some of the acute fevers.

Symptoms.—The only symptom indicative of this affection is difficulty in swallowing, depending in its severity upon the degree of paralysis. Food is taken and not as a rule regurgitated, but the patient is conscious of its non-passage into the stomach from a feeling of discomfort somewhere in the course of the canal.

Diagnosis.—Little difficulty will be found in distinguishing the dysphagia of paralysis from that due to organic obstruction. In the first place the history of the case and the presence of other symptoms will of themselves frequently be sufficient to indicate the true cause of the trouble. But should any doubt still exist, it will be readily cleared up by the passage of a bougie, which will be found to pass without material obstruction. Auscultation will reveal also an absence of the normal œsophageal sound.

Prognosis.—The prospect of recovery depends upon the nature of the cause, of which the dysphagia may be but one

of the symptoms. Where the lesion is in the brain and in some part involving the nerves, little hope can be entertained of recovery. Where, on the other hand, the dysphagia is dependent upon some weakness in the muscular tissue, or connected with diphtheria or lead poisoning, a good result may be looked for.

Treatment.—In cases where the dysphagia exists only as a symptom, all curative treatment must be directed to the complaint to which it owes its origin. These cases, however, being frequently the most hopeless, palliative measures must be adopted, and the difficulty in swallowing overcome by the passage of a tube for feeding purposes. The patient's strength should be kept up by the administration of tonics. Iron, arsenic, or strychnine should be given, and the food should be of a nourishing and stimulating character. In order to give some tone to the muscular coat, electricity may be applied. The negative electrode should be introduced within the canal, while the positive is placed against the skin of the spine posteriorly. According to instructions given by Morell Mackenzie, who states that he has successfully adopted this method on numerous cases annually, the treatment should be carried out daily, if not more frequently, each application lasting a few seconds, and the time for its use being preferably before meals. The treatment usually needs to be carried out for some weeks.

Spasm.—Œsophagismus, as this condition is sometimes called, is an abnormal contraction of the muscular coat, whereby a narrowing of the canal is produced, and, as a consequence, difficulty in deglutition. More or less spasm always accompanies the impaction of a foreign body, but such contraction is due to local irritation produced by the body itself, and is therefore not included in the present class of cases. Any part of the gullet may be subject to spasmodic contraction, but probably its most frequent seat is at the cardiac extremity. When occurring at this region it is as likely to be connected with the stomach as with the œsophagus, so that while the symptoms may be more of what would be termed œsophageal, it is quite probable the actual cause of them may be gastric. For this reason it is not unfrequent to find the condition described as spasmodic contraction of the cardiac orifice of the stomach. It affects, however, in no way the discussion of the disease, which is

probably better considered here than under the section of diseases of the stomach.

Etiology.—In a large proportion of the cases the condition is associated with a highly nervous temperament. This appears in many cases to be the only explanation. More commonly, however, some localised exciting cause exists, and this, acting upon an unstable nervous system, produces the condition.

It is difficult, in many instances, to trace the connection between the exciting lesion and the apparently reflex spasm. But when it is remembered how numerous are the connections of the vagi—the motor and sensory nerves of the gullet and stomach—with the various tissues and organs of the body, it will at least be gathered how many are likely to be the lesions which may serve as incentives to an attack of spasm, especially in a predisposed individual.

Among the various causes, then, which may be mentioned as in some way, either reflexly, directly, or otherwise, giving rise to spasm, is profound emotion, as from fear, passion, or great excitement of any kind. Hereditary proclivities have been traced in some instances. Imagination is a known cause, as in the belief of a foreign body in the gullet, or as the result of being bitten by a dog, the mimicry being that of hydrophobia. In hydrophobia, as is well known, spasm is a prominent symptom.

Carcinoma of the liver affords some striking illustrations. Mayo Collier * relates a case where the patient had suffered for three months from difficulty of swallowing. Death resulted from extensive cancer of the liver. No disease existed in the œsophagus or elsewhere. This author had looked over the record of cases of cancer of the liver, and in four of them it was noted that the disease was associated with reflex stricture of the œsophagus. Treves informed this author also that three cases which had been handed over to him for operation proved not to be stricture, but cases of cancer of the liver. Among other causes are affections of the stomach and intestines—intestinal worms; gout, especially, as pointed out by Brinton,† when dyspepsia

* *Journal of Laryngology*, 1894, vol. viii. p. 94.
† *Lancet*, 1866, vol. i. p. 3.

is a prominent symptom; repeated vomiting; pregnancy, menstruation, more often at its first appearance and at the climacteric, and painful affection of the uterus and appendages — leucorrhœa, menorrhagia, and dysmenorrhœa; various affections of the ear, teeth, tonsils, nose, nasopharynx, and larynx; chorea and epilepsy. Lastly, and possibly the most frequent of all causes, are hysteria and hypochondriasis.

Reference should be made here to what Paget* has termed "stammering with the œsophagus." While allied to spasm, Paget is inclined to consider it a different affection. The symptoms resemble very closely those described by the same author as characteristic of "urinary stammering." "Sometimes swallowing is easy and unhindered; at others very difficult, especially in company, or when the trouble is particularly inconvenient, or the mind too much set on it."

Symptoms.—The dysphagia characteristic of spasm is usually sudden in its onset. The patient may be in the middle of a meal when he suddenly finds difficulty in swallowing a bolus of food or a mouthful of fluid. Occasionally it is at once regurgitated, and sometimes so violently as to be ejected through the nostrils. At other times a sensation of obstruction or oppression is felt which only lasts for a short time, when it passes off and the material is felt to pass on into the stomach. Regurgitation is more frequent when the spasm attacks the upper part of the gullet, and in these cases the food is ejected immediately after being taken. The spasmodic attacks vary in frequency and severity, and may extend over long periods. A characteristic feature in the attacks is their want of regularity and the way in which they may be increased in severity by excitement or any other form of emotional disturbance. Thus they may vary in severity at different meals, often being less marked at supper than at an earlier diet. It has further been noted that when the attention has been diverted, the dysphagia has been less. Although the affection is mostly intermittent, cases occasionally reach a stage in which there appears to be no relaxation of the spasm.

Intolerance of food is sometimes absolute, and an actual distaste for it exists in many cases associated with dyspepsia.

* *Clinical Lectures and Essays*, 1875, p. 82.

Gaseous distension of the stomach is frequently a distressing symptom in cases of spasm at the cardiac orifice. In other cases, again, there are vagaries in the choice of aliments, their temperature, consistence, and nature being matters of consideration. As a rule warm foods are tolerated better than cold; and not infrequently solids can be taken better than fluids. The sensations experienced by the patient vary. When the spasm attacks the upper part, the patient often imagines that a foreign body of some kind is in his throat. Spasm in this region also is often associated with spasmodic contraction of the muscles of the neck, and of the larynx and pharynx, so that troubles in connection with the voice and respiration are complained of, amounting sometimes to feelings of strangulation and suffocation. Pain, when it exists, varies in its intensity, duration, and seat. In some instances it consists in a sense of fulness or oppression about the xiphoid cartilage. When severe it sometimes has a deterring effect upon the patient from taking nourishment. It is not usually of any diagnostic value, but interscapular pain occurs when the spasm is in the upper part of the œsophagus. Hiccough is sometimes present. Emaciation, when it exists, indicates usually either that the affection has lasted for a long time, or that it is associated with gastric disturbances.

Along with the dysphagia there are usually other symptoms of the disease or functional disturbance upon which it depends. Thus in the case of gout it will probably be "attended with great acidity and loading of the urine with uric acid and urates, and is often connected with tympanitic distension of the stomach and intestines." In cases of hysteria or hypochondriasis, something in the history of the past habits of the patients, or possibly in their present condition, will suggest the neurotic origin of the complaint.

Diagnosis.—The disease for which spasm of the œsophagus is most likely to be mistaken is some form of organic stricture, and the fact that spasm is often associated with such diseases renders the diagnosis not always devoid of difficulty. The age, sex, and general condition of the patients are often sufficient of themselves to enable a diagnosis to be made. Thus in cases of spasm the patients are frequently young anæmic women or girls, often in good physical condition. The dysphagia is of sudden onset and generally

intermittent; and when such distinctive symptoms exist as a distaste for food, or a better passage of solids than of liquids, or greater ease in swallowing warm than cold aliments, or immediate regurgitation after deglutition—the opposite of any of which conditions is the rule in carcinoma —little doubt will exist as to the true nature of the obstruction. The diagnosis will be verified by the passage of a bougie and by auscultation. The passage of a bougie will in some cases at once settle the question of mere spasm by the ease with which it passes into the stomach. In other cases, however, the contact of the bougie at once increases the spasm, but with gentle and persistent pressure relaxation may follow, and the bougie pass on. Occasionally, though rarely, the spasm is too great to be overcome. In such cases it is wise to desist for a time, and try again after the adoption of some calmative therapeutic measures. Auscultation reveals an absence of the normal œsophageal sound. The arrest of the morsel will be indicated by an arrest of the sound, followed often, however, by another sound of "bubbles of gas bursting in a liquid." At times an intermittency in the progress of the bolus may be made out.

Prognosis.—Speaking generally, spasm of the œsophagus is a curable affection. It has, in a very few exceptional instances, led to a fatal result. Depending as it does upon so many causes, its duration and severity are solely affected by the disease to which it owes its origin. Hence, when due to a neurotic or functional disturbance, a more rapid and lasting cure may be expected than in cases where there is some chronic local disease reflexly producing the spasm, or some more general affection, such as gout. But in every case the relief of the exciting cause may be suspected to be rapidly followed by a subsidence of difficulty in deglutition.

Treatment.—As a rule, patients suffering from œsophageal spasm will need to be treated for the condition itself, as well as for the cause upon which it may depend. As regards the local treatment, the simple passage of a bougie may be sufficient to cure the spasm. In cases where the mucous membrane appears intolerant of the presence of a bougie, the parts may be rendered less irritable by some topical application. The patient may be given a cocaine lozenge to suck, or the bougie itself smeared with oil of

theobroma containing about 5 per cent. of hydrobromate of cocaine. In some cases subcutaneous injections of morphia have answered; in others the internal administration of bromide of potassium, strychnine, or belladonna. The employment of electricity has succeeded when the passage of a bougie has failed. As regards the treatment of the various causes giving rise to spasm, little need be added here. Hysteria, gout, affections of the throat, ear, &c., need each to be dealt with according to the principles governing the ordinary treatment of these diseases. Some judgment will be required in the proper selection of nourishment. Any food liable to excite spasm should be withheld, and it will generally be found that fluids rather than solids will answer best; and warm materials rather than cold. In cases of a distinct anæmic and neurotic character every attention should be devoted to the general health by prescribing suitable exercise and mental diversion. In some cases of spasmodic contraction of the cardiac orifice, associated with possibly some thickening or organic contraction of the part, much good has resulted from overstretching the stricture with some form of dilator.

CHAPTER X.

ABNORMALITIES: DILATATION. DIVERTICULUM. CONGENITAL ATRESIA. CONGENITAL STENOSIS. TORSION.

Dilatation.—As distinguished from a pouch or diverticulum, dilatation of the œsophagus implies a more or less general expansion of the canal. It may involve the whole gullet between its extreme limits, producing a spindle-shaped dilatation, or only the lower segment. It usually involves uniformly the calibre of the canal, but occasionally, though rarely, there is a greater bulging in one direction. Where the dilatation is general, the widest part is about the middle, so that the canal presents a somewhat fusiform outline. In

cases following upon obstruction at the cardia, the widest part is near that region.

Etiology.—Numerous causes have been suggested as giving rise to this rare condition. That it occasionally ensues as the result of some form of obstruction is certain. In cases both of carcinoma and cicatricial stricture instances have been recorded, and in one case at least it seems to have resulted from external pressure, as for instance from a greatly dilated aorta. Among other possible obstructive influences are spasm of the cardia, and defective reflex relaxation of the same orifice. A special form of dilatation, known as the "spindle-shaped," is supposed to arise as the result of some spastic contraction of the lower end of the gullet. Other cases seem to depend more directly on the condition of the wall of the gullet itself; thus a catarrhal affection of the mucous membrane appears to have been a likely incentive in more than one instance. The possible explanation in these cases is that the inflammation extends into the muscle tissue so as to damage its structure and impair its function, the result being that food accumulates and distension takes place. Among other causes, paralysis and general muscular atrophy have been given. That disease of the vagi should give rise to dilatation has been theoretically suggested by Einhorn, who based his opinion upon the physiological experiment that division of the vagus causes food to lodge in the lower part of the gullet. Atony of the longitudinal muscular fibres, leading to difficulty in the opening of the cardiac orifice, is suggested as a possible explanation in certain cases. In some recorded instances the patient's first symptoms of dysphagia dated back to an accident. What can be the connection between a "severe blow on the sternum," a "violent strain," and a "fall" in producing dilatation it is difficult to say. That some cases are congenital is confirmed by the observation of Zenker. The enlargement of the canal at such an early period of life has suggested the homology of the first stomach of a ruminant. Knott* points out that a distinguishing pathological feature between congenital and acquired dilatations is that in the former "the muscular coats of the œsophagus are found to be hypertrophied," while in the latter "the opposite condition of atrophy and attenuation is sometimes met with."

* *Pathology of the Œsophagus*, p. 19.

Symptoms.—The dysphagia and regurgitation, which are the prominent symptoms of dilatation, are often of prolonged duration, in some cases dating back to childhood. Although the disease may be congenital, the symptoms do not usually appear till the patient is some years of age. The difficulty in swallowing, at first only slight, gradually increases, and is accompanied by pain, which varies in degree and kind. It is usually located at some particular spot, where a sense of obstruction also exists Relief is often obtained by the adoption of some special attitude; thus one patient would walk up and down, making deep inspiratory and expiratory efforts, at the same time pressing forcibly with his hand: by such means he was enabled to get the food into his stomach, and so relieve himself of the pain and inconvenience. Another "was obliged to take his meals in a semi-recumbent posture, with his right arm over the back of the chair." While in another instance the man had to stretch himself, when the food was heard to enter his stomach with a loud gurgling sound. In other cases relief can only be obtained by vomiting, the feeling of distension becoming so intolerable that, rather than wait and strive to get the food down, the patient ejects the contents of the distended gullet through the mouth.

The length of time after taking food before it is regurgitated varies. In some cases it is returned almost immediately, while in others, hours, and even days may elapse. In any case, the food so ejected is found to be free of pepsin and hydrochloric acid, thus indicating that it does not come from the stomach. The longer the food remains lodged the more likely it is to decompose, with the result that the breath may become very offensive. Where the distension is considerable, the heart's action may be mechanically impeded and symptoms of faintness ensue. The degree of emaciation will depend upon the quantity of nourishment which finds its way into the stomach. Mucus and saliva collect sometimes to a considerable extent and are hawked up. Troublesome coughing is also occasionally present, and serves to evoke attacks of vomiting.

Diagnosis.—It will be readily understood how apt such cases are to be set down as due to stricture. The length of time since the onset of the dysphagia, the age of the patient, and the general history of the case will largely assist towards

a correct differentiation. But the most confirmatory evidence of dilatation will be found in the ease with which, in the majority of cases, a large-sized bougie may be made to pass into the stomach. That success, however, should follow such attempts, the passage of the bougie must only be tried when the gullet is empty; that is usually after the patient has vomited; even under these conditions difficulty is sometimes encountered owing to the twisting or doubling of the bougie upon itself.

Prognosis.—While it may be said to be impossible to cure this disease, much may be done to prolong life. When death is directly due to the dilatation, it is usually the result of inanition; hence it may be expected that the larger the amount of food ejected, the shorter is likely to be the patient's life. That life may be prolonged for several years is abundantly shown by cases that have been recorded.

Treatment.—Much may be done by careful attention to diet, and, in some cases, by a properly regulated use of a feeding tube. The food taken should be in small quantities, in large part fluid, and taken at frequent intervals. The patient's feelings, however, will often prove the best guide both as to the quantity and quality of nourishment required. Every endeavour should be made to prevent an accumulation in the gullet. The use of a feeding tube, where considered necessary, not only enables a proper amount of nourishment to reach the stomach, but gives rest to the œsophagus, permitting the latter to recover a certain amount of its contractile power. In cases where the dilatation is secondary to stricture, the latter will need to be treated in one or other of the ways already indicated for that condition.

Diverticulum.—Although rare, numerous cases of œsophageal diverticula are to be found recorded, and it is more than probable many others escape observation. The condition does not always give rise to symptoms, and occasionally diverticula are accidentally met with in the course of a post-mortem.

Etiology.—The origin of these pouches is usually ascribed to one of four causes: either they are (1) congenital, or they are dependent upon a (2) strictured condition of the canal below, or they result from (3) pressure within or (4) traction from without.

(1) *Congenital.*—Francis* suggests three theories for their occurrence: firstly, that they might be analogous to the diverticula which were found in some of the Sauropsida and in ruminant animals—forming the first two compartments of the stomach; secondly, that they were fœtal varieties analogous to the œsophageal diverticulum from which the larynx, trachea, and lungs are formed; and thirdly, that they resulted from a failure in the internal closure of a branchial cleft.

(2) *Stricture.*—In cases resulting from this cause, it is supposed that some spot above the obstruction, weakened through inflammation and ulceration, gradually yields, and on account of the repeated pressure to which it is subjected in every act of deglutition, the wall becomes forced out into a pouch. The condition is likened to similar pouches found in the bladder and rectum, where a stricture prevents the normal escape of the contents of the viscus.

(3) *Pressure.*—In this class it is assumed that there already exists naturally some predisposed weakened spot in the walls of the gullet, the continual subjection of which to the normal pressure exercised in deglutition leads to the formation of a pouch. Not therefore that there is undue pressure within, but that there exists abnormal weakness in the walls. One place which appears thus to be specially disposed is the junction of the pharynx with the œsophagus posteriorly. Here the inferior constrictor above merges with the circular muscle fibres of the œsophagus below, both being placed transversely; and since also this is the narrowest part of the canal, where anteriorly is situated the unresisting cricoid cartilage, greater pressure in deglutition is brought to play here than in any other part of the canal. Strangely nature seems to have failed in not compensating for this weakness, although it must be confessed that, considering the rarity of the disease it may well be questioned whether we are wholly correct in blaming nature and not some other unnatural cause. It may be well to remark here that these particular diverticula are sometimes described as pharyngeal. Occurring as they do at the junction of pharynx and œsophagus, they have perhaps as much right to be associated with the one as the other; but considering,

* *Lancet*, 1887, vol. ii. p. 1271.

on the other hand, that the symptoms are almost always œsophageal in character, it would appear better to retain them in this connection.

Struthers, as quoted by Francis, points out an area of weakness a little below the bifurcation of the trachea, due to the absence of any material external support to the gullet in this situation.

(4) *Traction*.—By this method the wall of the œsophagus is acted upon by some external inflammatory influence, which in the process of healing and contraction leads to the formation of a funnel-shaped-like process. These diverticula are found most commonly opposite or near the bifurcation of the trachea. The reason for this lies in the greater frequency with which inflammatory processes take place in connection with the lymphatic glands situated in this region.

These traction pouches or, better, infundibuliform processes, are usually directed transversely outwards, or obliquely upwards, so that their size is not materially affected by the lodgment of any quantity of food. There is risk, however, associated with small fragments becoming impacted. In such cases ulceration may be set up, leading to the formation of a septic abscess; and this latter finding its way into some neighbouring structure or organ, may cause a fatal result.

Diverticula occasionally arise from the impaction of foreign bodies. In one sense these might be deemed pressure diverticula, but they differ in this respect, that they are essentially and almost solely due to pressure, and not to any abnormal weakness in the walls of the gullet. In most of these cases the pouch simply forms a sac for the encystment of the foreign body, and must be considered as a means of cure; in other cases, however, it is possible, either from a gradual increase in the size of the sac while the body is retained, or a similar increase after its ejection, for a true diverticulum to be produced.

Pathology.—In structure diverticula vary. In some cases they possess a wall of mucous membrane, submucous tissue and muscle; while in others there is an absence of any muscle tissue, the sac consisting of a dense substratum of fibrous tissue lined with mucous membrane. The existence of muscle, except around the orifice of the sac, is denied by Zenker, who failed in a number of careful obser-



FIG. 12.—DIVERTICULUM OF THE ŒSOPHAGUS.—The posterior wall of the pharynx and the diverticulum is laid open. Two directors mark the continuation of the gullet. (*Hunterian Museum, University of Glasgow.*)

vations to detect its presence. If, for the present, traction diverticula be excluded, the other forms may be said to be either true hernial protrusions of the lining membrane, or possibly fœtal varieties of the same nature as the normal diverticulum of the œsophagus, from which the lungs are developed. In size and shape they exhibit considerable varieties. In most instances the size depends upon the time the pouch has been in existence. Small at its origin, it enlarges from repeated fillings and continuous pressure. In some cases the opening into the pouch is much narrower than its body or fundus, giving the sac a pedunculated or pear-shaped appearance; in others the reverse conditions are found, and the orifice of the sac is not only larger than the sac itself, but is in excess of the calibre of the œsophagus in its continuity below. (See Fig. 12.)

As may be gathered from what has preceded, the most frequent position for diverticula is opposite the cricoid cartilage. As the sac increases in length it passes downwards between the gullet and the spinal column; and, owing to the resistant action of the latter, any increase in bulk of the pouch causes pressure upon the œsophagus in front. This becomes greater the lower the tumour descends. By reason of the counter resistant action of the sternum, the œsophagus gets squeezed by the distended pouch between the spine behind and the manubrium in front.

As indicated in describing the etiology of diverticula, they are occasionally met with in other situations than that just described. Thus they have been found at the lower part of the canal, at a point a little below the end of the trachea. Traction diverticula, as stated above, are most frequently found somewhere in the locality of the bifurcation of the trachea.

Symptoms.—As a rule it is not until the diverticulum has reached a sufficient size through the increasing accumulation of food, that the patient begins to complain of some sense of obstruction or oppression, localised usually at a spot on the neck or chest opposite the seat of impediment. Occasionally, however, obstruction takes place at the orifice of the pouch. independently of any distension of the sac itself. Intimately associated with the pain and feeling of oppression is the immediate relief experienced when the patient ejects the contents of the sac. This occurs in some cases involun-

tarily, but is more frequently effected by the patient himself. When the diverticulum exists in the neck, it can sometimes be felt as a tumour situated deeply beneath the gullet, and is observed to project laterally, or produce an appearance of fulness when food is taken. On pressing the swelling, as can be accomplished by the patient himself, the contents of the sac may be heard to gurgle into the mouth. The feeling of obstruction is occasionally felt to begin above and descend. This is probably explained by assuming that the difficulty first felt is at the orifice of the pouch, but as the latter fills it causes greater pressure lower down. The reverse sensation has also been experienced—that is, the feeling of obstruction has appeared to ascend. In other cases the complete filling of the diverticulum implies total obstruction. The length of time during which food may remain in a diverticulum varies. In some instances it amounts to days, and under such circumstances the contents are liable to decompose and the breath become fœtid. Food regurgitated will be found to be free from any acid reaction and shows no signs of having undergone digestion, thus proving its return from the œsophagus and not the stomach. A large diverticulum, occurring either in the neck or in the thorax, may produce serious symptoms from pressure on blood vessels and nerves; and even the heart's action may be impeded when the swelling projects forwards to any material degree in the posterior mediastinum.

Diagnosis.—But little difficulty is encountered in diagnosing many of those diverticula which occur in the neck provided they are sufficiently advanced in size. The existence of a tumour which is found only to form during deglutition, and to be capable of being emptied by pressure, may be said to be pathognomonic. Where, however, the diverticulum is situated in the thorax, some difficulty will arise in distinguishing the affection from stricture and dilatation.

Excluding such aids to diagnosis as may be elicited from the history of the case, its onset and progress, the most confirmatory evidence will be obtained from the use of a bougie. In any endeavour to pass an instrument when the diverticulum is filled with food, it will generally be found that the point of the bougie or tube will make its way into the distended orifice; while if an attempt be made when the pouch

is empty, there is a chance of it escaping the opening and passing with ease into the stomach. Independently, however, of such a condition the bougie will, in the same case, at one time pass, while at another it will not. This inconstancy is possibly due to a valvelike condition of the mucous membrane at the orifice of the diverticulum. Such a sequence of events will at once exclude stricture, but may still leave some doubt as to the alternative existence of dilatation. A few repeated passages of the instrument will, however, soon eliminate the latter, and the fact that a cavity is detected capable of being washed out will further aid towards a correct diagnosis. In one recorded instance use was made of the Rontgen rays. The diverticulum was first distended with a solution containing bismuth, and then skiagraphed. The result was to obtain a shadow of the pouch which it was possible to measure.

Prognosis.—The progress of the disease is in most instances slow, but sooner or later trouble will arise from obstructive effects. Careful feeding will, however, tend to ward off this difficulty. Wasting sets in so soon as it becomes impossible for sufficient nourishment to be taken, and such inanition is but the forerunner of death from starvation. Fortunately, wherever the diverticulum exists in the neck or can be reached from that region operation holds out a perfect cure, and several cases are now recorded where total excision of the sac has effected complete relief. Diverticula due to traction do not as a rule give rise to obstruction, but the danger connected with them is the possibility of perforation and the sudden onset of serious symptoms due to secondary complications.

Treatment.—Something may be done to mitigate temporarily the sufferings of the patient and prolong life, but within recent years a great deal has been accomplished in the way of effecting a cure. As regards relief, a careful selection of food should be made. Solids should be avoided except when they are well minced and mixed up with fluid. By means of a tube the cavity should, if possible, be washed out once a day, so as to prevent accumulation. In one case it was noted that the patient could take food better in the recumbent position than in the erect. By means of a tube also, or catheter, food may be successfully conveyed past the lip of the diverticulum. When such conservative measures fail, and the

patient shows signs of sinking from starvation, gastrostomy must be performed.

The most successful treatment of cervical diverticula is, however, now to be found in total extirpation. It may be said that, so far as one is permitted to draw conclusions from several recorded cases, the operation of excision of a cervical diverticulum is attended with but little risk, and is capable of accomplishing a perfect cure.

For the operation for excision of diverticula see chap. xii. on operations of the œsophagus.

Malformations or deformities.—Some of these are to be found in monstrosities, but those to be dealt with here are only such as occur or exist in the living.

The malformations met with in life are congenital atresia or deficiency, congenital stricture, congenital diverticula, and torsion. Of these, congenital diverticula have already been dealt with. Of the remainder, congenital atresia or deficiency is by far the most common.

Congenital atresia.—Pathology.—In these cases it is usually found that the pharynx or œsophagus terminates in a cul-de-sac somewhere about the level of, or a little below, the cricoid cartilage. Extending from this, for a distance of about an inch, is often a fibrous cord which terminates in the lower segment of the gullet, that part which is connected with the stomach. The part of the œsophagus continuous with the stomach is usually normal; but on tracing its channel upwards, it is very frequently found connected by a small opening with a trachea. The cause of this defective condition of the œsophagus is dependent either upon some disease in early fœtal life or some incompleteness in the process of development.

Symptoms.—It is not long after birth that indications are prominently given that there is obstruction in the gullet, Almost immediately after the child takes the breast, or has been fed with milk, it vomits, returning all that has been swallowed; so that if it is possible to collect what is ejected it will be found to equal in quantity that given. In some cases dyspnœa supervenes upon the return of the milk, due to some of it finding its way into the larynx. Although no food enters the stomach, meconium may be passed. The child rapidly emaciates and dies. The length of life depends upon the general state of nutrition of the child. In

one recorded case, life was prolonged for eight days; but in the majority of instances death has occurred on the second or third day.

Diagnosis.—The passage of a bougie will at once detect the existence of obstruction. As a rule the instrument will be found not to pass much beyond the cricoid cartilage; that is to say, a distance of from three to four inches from the lips. Independently, however, of the passage of a bougie, the sudden and complete return of all food will in nearly all instances sufficiently indicate the true nature of the case.

Treatment.—Anything operative upon a child so young is of itself of considerable gravity; nevertheless, if life is to be prolonged it must be by operation. At present no other alternative than gastrostomy seems at all reasonable. The condition, however, itself is sufficiently grave to warrant it. If it should ever prove successful, then Holmes's suggestion of cutting down upon the upper cul-de-sac and endeavouring to get a connection between the two segments, might later be considered. It must always be remembered that the unfortunate complication of a communication of the lower segment with the trachea, which exists in the majority of cases, renders every endeavour less likely to be successful than might otherwise be expected.

Congenital stenosis.—In my larger work I collected eight cases which had been recorded of this rare affection. The part of the œsophagus stenosed may be either the upper or the lower end. When occurring above it seems possible that the explanation of the condition may be found in some developmental defect connected with the early formation of the pulmonary diverticulum. As a sequel to the constriction, dilatation of the œsophagus may take place above it. The passage of a bougie will sufficiently indicate the existence of the stricture and determine also other features connected with its breadth, degree of tightness, and extent.

The conclusions to be drawn from the few cases recorded seem to be that life may be prolonged to comparatively old age, with freedom from any material discomfort so long as the food taken is carefully selected, well masticated, slowly eaten, and either mixed with or followed by fluids. Any indiscretion in this respect is liable to invoke spasm around the constricted part and so for a time increase the difficulty of deglutition. As regards treatment of the

stricture, dilatation with bougies should be attempted. But it is doubtful whether good will follow in all cases, for the conditions are not comparable to such as exist in cicatricial stricture. Operations, especially those of a cutting character, are not advisable.

Torsion of the œsophagus.—One or two cases have been recorded of this rare condition, but too little is at present known of it to deserve more than a passing notice.

CHAPTER XI.

EXTERNAL INFLUENCES: PRESSURE. PERFORATION. DISTORTION.

Irrespective of diseases which may be said to be directly connected with the walls of the œsophagus, there are certain influences exercised upon it from without which, from the nature of the symptoms produced, are liable to be mistaken for an affection of the tube itself. Thus it may be pressed upon, perforated, or distorted.

Pressure.—The commonest cause of pressure is aneurysm, and among other causes are enlarged glands, tumours, abscesses, a distended pericardium, enlarged auricles, and backward dislocation of the sternal end of the clavicle.

Aneurysms which cause pressure on the œsophagus mostly arise from the aorta, but in rare instances they have been connected with other large neighbouring vessels.

The symptoms at the early stage, besides those peculiar to the disease itself, are of the nature of some difficulty in swallowing. This difficulty, even when at its worst, rarely reaches the acute stage of that found in stricture; and the fact that in so many cases of aneurysm of the thoracic aorta there is an absence of all dysphagic trouble, shows that its appearance in any particular case must depend upon certain special relations between the aneurysm and the gullet. That the dysphagia is never severe finds

probably a correct explanation in two causes: one, the absence of any interference with the normal peristaltic action of the muscle wall; and the other, the limit of the pressure to one side. To these it would seem right to add the ease with which the gullet, from its loose anatomical connections, can adapt itself to any lateral displacement.

In cases of prolonged pressure from aneurysm attacks of hæmorrhage may take place; these, only slight at first, may terminate in a fatal copious gush. It appears that the process by which perforation is brought about is somewhat complicated. Thus the pressure of the aneurysm causes a circumscribed sloughing of the mucous membrane. When the slough separates an ulcer forms, and by its extension a communication is effected between the gullet and the aneurysm.

Pressure from enlarged glands is possibly almost as frequent as that from aneurysm. By enlarged glands is meant the thyroid in the neck, and the bronchial lymphatic glands in the region of the bifurcation of the trachea. Goitre is probably the commonest of all causes of pressure, particularly that form of it known as constricting goitre. A substernal bronchocele may also cause pressure. Enlargement of the cervical glands may exercise pressure upon the œsophagus in the neck; it is more usual, however, for the glands about the roof of the lung to press upon the gullet in that region. Pressure from tumours, such as carcinoma, sarcoma, lymphoma, and lympho-sarcoma, may take glace in any part of the course of the gullet. It is more frequent, however, with the exception of carcinoma of the thyroid, for these malignant growths to attack the posterior part of the canal, taking their origin from the spinal column.

Among innocent tumours exostosis of a vertebra has been known to give rise to compression.

Pressure from abscess occasionally occurs in cases of spinal caries. In a case which came under my own observation the abscess was seated behind the upper part of the sternum; the child had some little difficulty in swallowing both solids and fluids, always experiencing during the endeavour a disagreeable choking sensation. His most distressing symptoms were, however, connected with his

breathing. The case is recorded in the *Annals of Surgery.**

It must be remembered that in nearly all cases of compression of the œsophagus in the neck and in the upper part of the thorax the dysphagia will be associated with symptoms of dyspnœa. The amount of pressure sufficient to produce difficulty of swallowing will almost certainly produce greater difficulty in breathing. This association of dyspnœa with dysphagia will in many cases serve to distinguish between obstruction the result of external influences and that arising from disease of the canal itself.†

Perforation.—Many of the causes already given as productive of pressure may in their later stages result in perforation. Aneurysm, as indicated above, gives rise to hæmorrhage; perforation by external malignant growths may cause a like symptom. Tubercular glands in the process of suppuration may adhere to the walls of the gullet, and finally ulcerate into its canal.

Distortion.—It is rarely that the œsophagus is so bent upon itself that symptoms of obstruction show themselves. As might be expected, it is only, therefore, where the primary and compensatory curves are acute that such symptoms are likely to be met with.

* 1889, vol. ix. p. 193.

† See page 50 for exceptions in cases of carcinoma of the œsophagus.

CHAPTER XII.

OPERATIONS.

1. INTRODUCTION OF BOUGIES, FORCEPS, PROBANGS, EXTRACTORS, &C.
2. INTERNAL ŒSOPHAGOTOMY.
3. ELECTROLYSIS.
4. EXTERNAL ŒSOPHAGOTOMY (CERVICAL).
5. EXTERNAL ŒSOPHAGOTOMY (THORACIC).
6. ŒSOPHAGOSTOMY.
7. ŒSOPHAGECTOMY.
8. EXCISION OF DIVERTICULA.

THE operations to be described here are those only which directly implicate the gullet itself. Although gastrotomy and gastrostomy are both operations performed as a part of the treatment of certain diseases affecting this region, they will not be dealt with here, but will be found fully described in the chapter devoted to operations upon the stomach at the conclusion of the section which deals with the surgical affections of that region.

1. **Introduction of bougies, forceps, probangs, extractors,** &c.—For the passage of instruments the patient should, if possible, be seated on a chair or propped up in bed, and the surgeon should stand in front or on the patient's right side. The head should be slightly thrown back and securely held by an assistant. The arms also, especially in the case of children, should be secured either by a third assistant or enclosed in a binder passed round the chest. To keep the mouth open a gag may be used, but an ordinary wine-bottle cork is preferable. The instrument may be smeared with some lubricant such as glycerine, but it is not necessary as the mucous secretion of the gullet is usually sufficient to admit of an easy passage. It should be previously warmed by friction or hot water.

In the case of pliable instruments, these should be previously bent to the required curve and then taken in the right hand of the surgeon and carefully conducted to

the back of the pharynx. The end of the tongue secured by the operator between the finger and thumb of his left hand covered with a towel or piece of lint, will help to draw the larynx forwards, and give a means also of somewhat steadying the patient's head. In some cases it will be found better to depress the tongue with the finger, and guide the end of the instrument over the glottis. Immediately the instrument touches the back of the pharynx, the patient will retch; but as long as there is no real difficulty in respiration, indicative of its being within the larynx, which at all times is unlikely, it should be steadily pushed on. When once the instrument has properly entered the gullet, the patient if straining or retching should be induced to try and calm himself and breathe naturally before any further endeavour is made to push onwards. When thus quieted, he should be told to swallow —the tongue having, of course, been liberated. By so doing a normal peristaltic action takes place, which will be felt either to carry the instrument on, or materially facilitate its downward movement on pressure. In dilating strictures in the upper part of the gullet, the passage of bougies is much facilitated by drawing the larynx and trachea forwards between the thumb and fingers of the disengaged hand at the moment that the obstruction is reached by the dilating instrument.

Gentleness must in all cases be exercised. Any hitch in the progress of the instrument should not be overcome by force, but time should be allowed for the subsidence of spasm. If advance is still impeded the instrument should be withdrawn, and the endeavour renewed.

The question of the administration of an anæsthetic has already been discussed, and rather than occupy space here by repeating the arguments for and against its administration, the reader may be referred back to page 21.

It is useful to remember, in the introduction of bougies or tubes, that in the adult the distance between the incisor teeth and the orifice of the œsophagus is from five to six inches, and the length of the gullet itself from nine to ten inches. Hence the cardiac orifice will be distant from the teeth from fourteen to sixteen inches.

2. **Internal œsophagotomy.**—The cutting of a stricture from within the canal necessitates the passage of the cutting

instrument, or œsophagotome, through the contracted portion. Hence, prior to its introduction, it must be ascertained by the passage of bougies that the channel is sufficiently large. There are different forms of œsophagotomes, but the common feature underlying all is the presence of one or two concealed blades located at the distal extremity of the instrument, and capable of being projected to the required distance by mechanical contrivances placed in the handle.

In the manner already described for the introduction of bougies, &c., the instrument is passed down the œsophagus until it is judged that the bulbous cutting extremity is beyond the seat of stricture. The blade is or the blades are then made to project, and by a rapid pull outwards, of sufficient distance to traverse the length of the stricture, the latter is divided. The process may be repeated two or more times if thought necessary. To prevent any union of the cut surfaces, bougies should be passed within the course of a day or two. For dangers in connection with this operation see page 64.

3. **Electrolysis.**—Considerable use has been made of this method of treatment in strictures of the œsophagus; and, as already indicated in the section dealing with that subject, much success has attended its employment. I cannot do better than quote Steavenson on the "Uses of Electrolysis in Surgery," for the manner of putting this method into practice.

"A long flexible electrode, like an ordinary œsophageal bougie, is required, to which can be attached olivary metal ends of various sizes, as in the case of some of the electrodes used for stricture of the uretha and rectum. The electrode is connected with the negative pole of the battery, that connected with the positive pole being placed on some indifferent part of the body. A current strength of five milliampères is generally employed, and the current allowed to flow for fifteen or twenty minutes, unless the electrode passes the obstruction in a shorter time. It will be found, as in the case of strictures in other parts, that recontraction does not take place so rapidly as after dilatation, and that usually after a week's interval a bougie can be passed one size larger than that used on the former occasion. A perforated electrode has been used which will

pass over a celluloid guide so as to diminish the risk of its passing into a pouch by the side of the œsophagus, or of its decomposing laterally too much of the cancerous tissue of a malignant stricture, and by this means making an opening into the posterior mediastinum. The guide is sufficiently small to pass through the stricture and thus direct the passage of the electrode. As with other forms of treatment of œsophageal stricture, electrolysis gives more prospect of success with the fibrous variety than with the malignant."

4. **External œsophagotomy (cervical).**—This operation is usually performed on the left side of the neck, except in such cases where the position of the impacted body suggests that removal would be more easily effected on the right.

The patient is placed in the supine position, with the shoulders slightly raised and the head thrown back and rotated to the right side. The side of the neck is shaved free of any hairs, and the skin properly cleansed and prepared as for any ordinary antiseptic operation. The surgeon, standing on the left side of the patient, ascertains the necessary landmarks: the upper border of the thyroid cartilage, the sterno-clavicular articulation, and the anterior border of the sterno-mastoid. The skin being steadied between the fingers and thumb of the left hand, an incision is carried along the margin of the anterior border of the sterno-mastoid from about three-quarters of an inch above the sterno-clavicular articulation to the upper border of the thyroid cartilage. By this incision the skin, superficial fascia, and platysma myoides are divided, together with possibly some superficial veins; these latter should be at once secured, and if by any chance it is observed before making the incision that the line is crossed by either the anterior or external jugular, these should be first double-ligatured and then divided.

The next stage of the operation consists in a careful deep dissection down to the gullet. This should be effected mostly by snipping, teasing, or tearing the parts asunder, and not by any free cutting.

As soon as the internal border of the sterno-mastoid is exposed it should be hooked aside, and similarly the carotid sheath—with its vessels and nerves when sufficiently isolated

—should be drawn outwards and included with the muscle in the grasp of the same retractor. The omo-hyoid muscle, which crosses the space at its upper part, if it cannot be hooked aside must be divided as near as possible to its attachment to the hyoid bone, so as to avoid any interference with its nerve supply through the descendens noni. The sterno-thyroid and sterno-hyoid together with the thyroid gland must be drawn slightly inwards. To facilitate this lateral retraction of parts, the head should be slightly flexed. With a little further careful dissection through the deep fascia, the œsophagus will be reached lying beneath the trachea, which must also be drawn gently to the opposite side in order to better expose the former. In this latter part of the dissection the thyroid arteries should be avoided, or, if division is necessary to gain freer access, they should be first secured. The recurrent laryngeal, which runs upwards between the œsophagus and the trachea, must be carefully avoided; any injury to it would lead to impairment of the voice.

The final stage of the operation consists in opening the gullet. If the operation be for an impacted body which can be easily felt, no further guide is necessary for the incision. If, on the other hand, the œsophagus is in its normal flaccid condition, a bougie or sound should if possible be introduced by the mouth and made to project at the point at which the canal is to be opened. With a sharp scalpel the point of the projecting instrument is cut down upon and a small longitudinal incision made. If no instrument can be inserted, then the walls of the œsophagus should be secured at two points by two pairs of forceps, the parts between them drawn slightly forwards, and the knife carefully but quickly plunged into the canal. The incision can be enlarged by snicking with a pair of scissors in an upward or downward direction, or dilating with the finger or a pair of dressing forceps. To secure the opening, the edges may be transfixed with a silk suture, or held with two pairs of artery forceps. Any hæmorrhage is not serious.

Some difference of opinion exists as to the advisability of closing the œsophageal wound. If it is decided to do so, the mucous membrane should be stitched separately. If the muscle wall be included in the same stitch, there is a greater danger of the sutures cutting through. The

external wound may be closed for a considerable extent; and to remove the possibility of such serious consequences as would ensue from any leakage from the œsophagus, a small drainage tube should lead from the deepest part to the surface at the lower end of the wound; or no attempt should be made to close the wound, which is stuffed with iodoform gauze. Either tube or stuffing may be removed in the course of a few days if all seems doing well. When the patient is returned to bed, it is advisable to limit the movement of the head as much as possible, either by the way in which the bandages are applied, or by placing sand-bags on each side of the head.

If the patient's strength will admit, all nourishment for some days should be given by nutrient enemata; but if the system requires more support than can be got by rectal feeding, food should be given through a tube carefully introduced down the gullet.

5. **External œsophagotomy (thoracic).**—The operation of intrathoracic œsophagotomy practised by Portarca * on the dead subject, and proposed by him for cases of impacted foreign body in the mediastinal portion of the gullet, is thus described: "The body being turned over on the belly, a vertical incision, between five and six inches in length, the middle of which corresponds to the fourth dorsal spine, is made midway between the internal border of the scapula and the spines of the dorsal vertebræ. The following structures are divided in succession: the aponeurosis of the trapezius, and at the lower part of the wound some of its muscular fibres; the aponeurosis and lower fibres of the rhomboideus major, the aponeurosis between the two serrati muscles; then, after separation of the sacro-lumbales from the longissimus dorsi, the transversalis colli. The third, fourth, and fifth ribs having been thus exposed, a piece of bone about an inch in length is removed from each, the internal section of each rib being close to the transverse process of the corresponding vertebra. The pleura is now carefully stripped from the inner fragments of the ribs and the front of the spine, and the vena azygos exposed, in front of which will be seen the œsophagus at a depth of four inches from the wound of the skin."

* *Brit. Med. Journ. Epitome*, 1894, vol. ii. p. 79.

6. **Œsophagostomy.**—The steps of the operation as far as to and including the opening of the œsophagus are the same as in external œsophagotomy. The edges of the œsophageal wound are then caught up by forceps, and by means of gentle traction united by a silk stitch or two to the margins of the skin. The short tube used for feeding purposes measures about three inches in length below the bend and about one inch above it. To its shorter end is fixed a shield, so that after the introduction of the tube into the gullet, it is secured in position by tapes tied round the neck. As in the operation of tracheotomy, any undue gaping of the wound above and below the tube may be brought together by a few stitches. In feeding the patient a much longer tube and one of a less calibre may be advantageously inserted through the fixed one, so as to ensure that none of the material given finds its way into the periœsophageal tissues. In the event of the so-called "œsophagotomy tube" not being used as a guide, care must be taken in the insertion of the single tube that it does not make its way into the soft tissues instead of into the œsophagus. Solis-Cohen quotes an instance which came under his observation, where the rigid stomach tube had been passed. Instead of finding its way into the gullet, it went down into the mediastinum. The accident was undiscovered until after the death of the patient on the following day.

The remaining operations of Œsophagoplasty, Œsophagectomy, and Excision of Diverticula have been performed too rarely to admit of any precise details being laid down as to their execution. They have been limited so far to special circumstances affecting each case, and to the ingenuity of the surgeon operating. Some guidance, however, may be gained, in any subsequent attempts, by a brief summary of the steps taken in the few cases recorded, and where the surgeon himself has described the operation performed or made suggestions in reference to it.

7. **Œsophagectomy.**—The performance of this operation in the neck involves, in the first place, the free exposure of the gullet by the same incision as already given for external œsophagotomy; and, in the second, the freeing of that portion of the implicated gullet from the parts around, and its excision. The lower end of the canal is then brought out at the external wound, and secured there

by stitches to the skin. The chief difficulties of the operation are connected with the excision of the affected part, and its greatest dangers are in shock and subsequent septic mischief about the wound.

Endothoracic resection has been proposed by J. Nassiloff,* and the directions for the operation as quoted by Solis-Cohen are the following: "An incision through all the soft tissues is made parallel to the internal border of the scapula, seven to nine centimetres from the line of the spinous processes. Two other incisions are made at the two extremities of the first one. The flap being detached, four ribs are resected one after the other. The pleura is carefully separated from the ribs, and entrance is thus made at the posterior mediastinum. The œsophagus is now to be isolated, an œsophageal sound being introduced first if desired or if required, and raised on a soft hook. The œsophagus is secured by ligatures placed above the neoplasm and below it, the requisite portion is resected, and the ends of the gullet united by suture after the method of Czerny. If the neoplasm is very extensive it is proposed simply to cut the œsophagus and unite its inferior extremity to the skin by suture. The final step of the operation consists in recovering the wound with the flap of soft tissues."

8. **Excision of diverticula.**—The preliminary steps for the exposure of the diverticulum are the same as those given for the performance of external œsophagotomy. The pouch is then freed from all connections with surrounding parts, and its neck or junction with the gullet carefully traced. The severance of the sac from the main channel may be effected in one of two ways. It may be cut through, the edges of the mucous membrane of the gullet being then stitched together, as successfully performed by von Bergmann,† or the whole thickness of the œsophageal wall united, as also successfully accomplished by Butlin.‡ Instead of cutting the neck of the sac it may be secured by two ligatures placed apart, and division effected by the thermo-cautery applied between them. The treatment of the external wound will probably depend upon the surgeons'

* *Annual of the Universal Medical Sciences*, 1889, vol. iv. G—38.
† *Archiv für Klin. Chir.*, Bd. xliii. Heft. i. p. 1.
‡ *Trans. Med.-Chir. Soc. Lond.* 1893, vol. lxxvi. p. 269.

individual feelings with regard to the wisdom of completely closing it or not. Both von Bergmann and Kocher partially closed, stuffing the remaining part with iodoform gauze. The after treatment of these cases will be pretty much a matter for the judgment of the surgeon. It would seem advisable, however, to nourish, if possible, entirely by the rectum. In von Bergmann's case the patient was given water immediately after the operation. On the sixth day milk escaped from the wound. A small fistula resulted, but it was subsequently closed by means of the actual autery.

PART II.

THE STOMACH.

THE STOMACH.

CHAPTER XIII.

SURGICAL ANATOMY AND PHYSIOLOGY.

Surgical Anatomy.—Unlike the œsophagus, which maintains a fixed position, the stomach varies somewhat in its relations according to its degree of distension. The most fixed point is at its junction with the œsophagus; and where, by its other extremity, it becomes continuous with the bowel, it is only loosely secured by the lesser or gastro-hepatic omentum. This same fold of membrane extends along the lesser curvature of the viscus, and, passing to be attached to the liver above, tends to hold, as by a sling, all that part of the organ to the right of the œsophageal opening. The left extremity is further secured by two other folds of membrane. One, the gastro-phrenic ligament, passes up to the diaphragm; while the other, the gastro-splenic ligament, connects it with the spleen. The greater curvature has passing from it downwards the great omentum. This latter, being in its normal condition unattached below, allows of considerable freedom of movement of the dependent portion of the stomach. The natural position of the stomach is to a large extent vertical; it is only the pyloric portion that is placed transversely. So that the greater portion of the lesser curvature looks to the right, while most of the greater curvature looks to the left. Further about seven-eighths of the stomach are to the left of the middle line and the upper part of the cardiac cul-de-sac ascends for an inch or more above the cardiac orifice.

External relations.—The cardiac orifice of the stomach

corresponds posteriorly to a point slightly to the left and below the ninth dorsal spine, and anteriorly to a point just below the junction of the seventh costal cartilage with the sternum on the left side. The pylorus corresponds to a point close to the extremity of the eighth rib on the right side, that is, half an inch to an inch to the right of the middle line. When distended, the stomach comes in contact with the abdominal parietes about two inches below the ensiform cartilage. It occupies the left hypochondriac and epigastric regions.

Deep relations.—The pylorus and the upper part of the anterior surface are overlapped by the liver, the latter region coming in contact also with the diaphragm, while the former touches in some cases the neck of the gall bladder. Posteriorly the stomach rests upon the pancreas, the large abdominal vessels, and the solar plexus, the membranous transverse meso-colon intervening. By its left extremity it is in contact with the spleen, and close to the greater curvature courses the transverse colon.

Variations in position.—The comparative looseness of the connections of the stomach renders it liable to considerable alterations in its position from various causes. In the normal state this varies during the process of digestion. When distended it rotates about its long axis, the greater curvature being raised to the front, while the anterior surface is made to look forwards and upwards. In this condition the stomach comes in contact with the parietes. When empty and contracted, it lies back on the pancreas, giving rise to the hollow in the epigastric region of the parietes called the *pit of the stomach.*

In certain abnormal or diseased conditions, the position of the stomach undergoes considerable alteration. Thus distension of the chest with fluid will depress the viscus, while a similar condition of the abdominal cavity will press it upwards. It may also be caused to occupy a lower position by being dragged down by an omental hernia; or pressed down by tight lacing. Disease of the organ itself will produce variations. Thus tumour of the pylorus may cause that part to sink considerably below its normal position, and obstruction at the same situation will so increase the dimensions of the stomach that it will occupy an extensively increased area.

Structure.—The walls of the stomach are composed of four layers intermediate in thickness between those of the œsophagus and the intestines: an external serous coat consisting of peritoneum, an internal mucous lining, and an intermediate muscular coat; between the mucous membrane and the muscle is a distinct layer of areolar tissue. Lining the surface of the mucous membrane is a single layer of columnar epithelium; and located in the membrane are the secretory glands of the stomach. These latter are of two kinds. One kind is situated mostly at the pyloric end, and consists of glands lined throughout by an extension of the surface columnar epithelium. The other kind, the so-called "peptic glands," are lined with columnar epithelium near the surface, but towards their deeper parts the cells assume more of a spheroidal character. The mucous membrane is thinnest in the large cul-de-sac and thickest in the pyloric region. It moves freely on the muscular layer owing to the looseness of the intervening submucous areolar tissue. Hence, when in a contracted condition, it assumes numerous folds, which become obliterated on distension of the organ.

The stomach receives its arterial supply from the three branches of the cœliac axis; the greater cul-de-sac and cardiac region being supplied from the splenic and gastric branches, and the pyloric region from the hepatic. The main trunks pass round the greater and lesser curvatures between the layers of the two omenta, and from them branches ramify through the coats of the stomach, finally ending in a dense capillary network around the secreting tubules. The veins which arise from this network eventually empty into the splenic, mesenteric, and portal veins. The lymphatics, which form a dense network in the mucous membrane, surrounding alike the glands and the blood vessels, end by traversing the lymphatic glands which exist along both curvatures of the stomach. The nerve supply is from the cerebro-spinal and sympathetic systems. The motor fibres come from the pneumogastrics, the left being distributed to the anterior surface, and the right to the posterior, while the sensory come through the solar plexus. In addition there are plexuses of nerves and ganglia contained within the visceral walls. It should still further be noted, that the solar plexus receives fibres from the 6th, 7th, 8th, and 9th dorsal segments of the spinal cord, and that branches from

the 6th and 7th go to the cardiac region, while the pylorus is supplied from the 9th. Cutaneous branches from these same segments are distributed to the skin in front from just below the nipple to the umbilicus, and behind from just below the 5th to just below the 12th dorsal spine.

Physiology.—The functions of the stomach are twofold: (1) digestion, (2) motion.

The digestive properties consist in the conversion of nitrogenous or albuminous food into chyme; oleaginous and starchy materials being uninfluenced. This action is effected conjointly by a ferment called pepsin and by hydrochloric acid; these agents, together with some chlorides and phosphates and a large proportion of water, constitute the gastric juice.

The movements of the stomach, brought about by the contraction of its muscular coat, entail in the first place a thorough mixing of the ingested material with the gastric secretion; and in the second its propulsion from the stomach into the duodenum. The food as it enters the stomach passes through the relaxed or dilated cardiac orifice; it is then compressed by the contraction of the gastric parietes, and prevented from passing into the duodenum by closure of the pyloric sphincter, and from regurgitation into the œsophagus by recontraction of the cardiac orifice. The peristaltic action which sets in, besides serving more efficiently to aid digestion, causes, according to Brinton, a peculiar circulation of the contents of the stomach, whereby the digested materials take a peripheral course, and are finally propelled through the relaxed pyloric orifice into the duodenum. The central undigested portions, if not capable of digestion, follow as the residual products, the pyloric sphincter dilating sufficiently to admit of their passage.

Various circumstances, irrespective of organic disease affect the normal process of digestion. In some instances these are connected with certain physical causes, in others they are dependent upon the nature of the food taken, and a third class is associated with various nerve influences. Digestion is impeded when the temperature of the contents of the stomach rises a few degrees above 100° F., or sinks a few below it. Thus the ingestion of too much ice or a large quantity of cold water is liable to retard the action of the gastric juice. Again, any lack in the proper movements

of the stomach, whereby its contents fail to become well mixed with the gastric secretion, hinders digestion; and, lastly, any hindrance to a proper removal of the already digested material, such as arises in cases of pyloric obstruction, tends to a like detrimental result. With regard to the nature of the foods taken, certain substances appear to be more easily or more rapidly digested than others. Thus, as the result of some of Beaumont's * researches, it would seem that the flesh of wild animals is more easily digested than that of those of a more domesticated kind. And, further, that of these latter, beef is more digestible than mutton, and mutton than either veal or pork. Fowls are not so digestible as turkey; this latter, with the exception of venison, being one of the most digestible of animal foods. The time taken for the complete digestion of a meal varies between three and four hours. Among other circumstances which may be said to affect the process of gastric digestion are the general state of bodily health, the state of the mind, the amount of exercise before and after a meal, the time since the last meal, and the quantity and quality of the food taken.

It was long known that animals could live for years without a stomach, as instanced by Czerny's dog; but it has more recently been shown that even human beings can do the same, complete excision of the organ having resulted in but little or no inconvenience, as regards purely digestive functions. It therefore seems probable that one important function of the stomach is that of simply a storage receptacle, allowing of intermittency in the consumption of food.

* *Principles of Human Physiology*, Carpenter, 7th edit. p. 134.

CHAPTER XIV.

METHODS.

(1) OF OBTAINING GASTRIC JUICE FOR EXAMINATION.

(2) FOR DETECTION OF FREE HYDROCHLORIC ACID.

(3) OF ASCERTAINING THE RATE OF GASTRIC ABSORPTION.

(4) FOR DETERMINING THE MOTOR POWER OF THE STOMACH.

PHYSICAL EXAMINATION. PALPATION. PERCUSSION. AUSCULTATION. INFLATION. GASTROSCOPY. GASTRODIAPHANY.

In view of the increasing clinical importance of a practical knowledge of the constituents of the gastric juice and the movements of the stomach in certain diseases, it would seem advisable to describe these various conditions as they are supposed to exist in the normal state, and the methods adopted for ascertaining them. In what follows, the information has been mostly derived from Ewald's "Lectures on Diseases of the Stomach" as translated by Saundby.*

(1) *Method of obtaining gastric juice for examination.*—In order to obtain the gastric juice it is necessary in the first place to excite its secretion, and in the second to do so by such means as will not materially alter the juice so secreted. For this purpose what is termed a "test meal" is administered. As an example of this kind of meal, I shall only mention that which goes under the name of "Ewald's test breakfast." It consists of an ordinary dry roll and about three-quarters of a pint of warm water or very weak tea taken upon an empty stomach.

At the expiration of one hour the contents of the stomach are removed in the following way. The stomach tube—

* New Sydenham Society, 1892, vol. ii. Lecture I.

which should have a terminal hole and lateral ones, and be made of soft rubber—should be dipped in warm water and then pushed gently backwards to the posterior wall of the pharynx. The patient is then requested to swallow, and by the additional exercise of slight propulsion on the part of the operator. the tube can easily and quickly be introduced. The tube thus within the stomach, its contents may be extracted in one or more ways, either by suction with a pump, by the use of a compressed elastic ball, which on expansion sucks up the material into it, or by a simple process described by Ewald and known as his "method of expression." This last consists either in abdominal pressure exercised by the operator, or in active expressure on the part of the patient; both methods push the contents of the stomach into the tube, provided only that the former are sufficiently fluid. As pointed out by Ewald, this method should not be tried when there is danger of rupture of an aneurysm, brittle vessels, &c.; and, again, it may fail "when the abdominal wall is so relaxed that abdominal pressure cannot be applied, and where the patient has no control over his muscles, and is unable to press when desired to do so, or perhaps make convulsive efforts to cough."

Einhorn * has introduced an apparatus which "consists of a small oval vessel ($1\frac{3}{4}$ ctm. long, $\frac{3}{4}$ ctm. wide) made of silver; on the top of the same is a large opening with an arch over it; on to this arch a silk thread is tied." The patient is made to swallow the "bucket" about an hour after the test breakfast. After an interval of five minutes it is withdrawn, and its contents can then be tested.

The contents of the stomach thus removed are filtered, when a fluid clear as water, but possibly tinged slightly yellow or brown, is obtained as a filtrate. This fluid is strongly acid, and owes its acidity to hydrochloric acid and acid salts.

(2) *Method for the detection of free hydrochloric acid.—Günzburg's method.*—The test solution consists of

2 grms. phloroglucin
1 grm. vanillin
30 grms. absolute alcohol.

* *New York Medical Record*, 1890, vol. xxxviii. p. 63.

"It is not necessary to filter the stomach contents before testing it. One or two drops in a capsule or on a strip of filter paper with the same quantity of the reagent are sufficient. . . . The reaction is always bright red, or, with very small quantities, pale rose colour. The fluid does not change on the instant of adding it; but if the capsule is gently heated over a lamp, so that the fluid does not boil but slowly evaporates, at the border of the evaporated drops a bright red patch or small very fine red streaks appear." Any excess of heat causes a brown, brownish yellow, or brownish red colour to appear. This same method for the detection of hydrochloric acid may be used for obtaining an approximate quantitative estimate of the amount present. "By successive dilutions of stomach contents giving Günzburg's reaction to $\frac{1}{3}$, $\frac{1}{5}$, $\frac{1}{10}$, &c., until the reaction no longer occurs, we can estimate approximately the amount of actually free hydrochloric acid, as the lowest limit is about $\frac{1}{20}$ per mille. If the red colour, for example, is still obtained with the twentieth dilution, the gastric juice contains 1·0 per mille, or 0·1 per cent. of free hydrochloric acid. But one may make a rough guess at the amount of acid according to the intensity of the red coloration." The solution used for this test readily undergoes decomposition when exposed to light. It must therefore be kept in a dark-coloured, well-stoppered bottle.

Another method recently introduced by Töpfer seems likely from its simplicity, and the comparatively easy way in which a quantitative analysis of free HCl can be made, to replace previously employed methods. It is called the Dimethyl-Amido-Azo-Benzol Test. A few drops of a 0·5 solution of the substance in alcohol are added to the stomach contents, which need not be filtered. If free HCl be present a cherry red colour develops, spreading in rings and usually leaving in the centre a clear yellow area. The test fails in one respect, that if a very large quantity of lactic acid is present the same reaction is obtained. It rarely, however, if ever happens that such an amount is present as to be able to produce this effect.

(3) *Method of determining the rate of absorption from the stomach.*—"The absorption by the gastric mucous membrane is proved by means of iodide of potassium. Following

Penzold * we give small doses, 0·1 grm., in capsules which are carefully wiped so that no iodide of potassium is on the outside, and we determine the moment when the salt first appears in the saliva, by help of its well-known reaction on starch solution. Filter paper is soaked in starch solution, dried, and, after the capsule has been taken, the saliva of the patient is tested with it from time to time, about every five minutes. On the addition of fuming nitric acid we can recognise at once, by the occurrence of the blue colour, the appearance of iodine in the saliva. As a rule it takes place in about ten to fifteen minutes. But when absorption from the stomach is delayed, the reaction may appear much later, from half an hour to an hour or more. . . . When absorption is delayed until one or one and a half hour after eating, it is distinctly pathological."

(4) *Method for determining the motor power of the stomach.* —The object of this investigation is to ascertain the rapidity with which substances taken into the stomach are transmitted by it into the duodenum. This has been approximately effected by the administration of salol, a substance which is not acted upon by the gastric juices, but becomes decomposed when under the influence of the pancreatic secretion. Salol splits up into salicylic acid, phenol, and the conversion product of salicylic acid, salicyluric acid. "Under normal conditions, salicyluric acid appears in the urine forty to sixty or at latest seventy-five minutes after one gramme of salol has been taken, which is best given during digestion—longer delay indicates slowing of the transfer into the intestine. Salol is a tasteless white powder, and is easily taken. It may be ordered in capsules, or employed in the form of keratin pills, but sometimes these pass undissolved through the bowel, and such pills may easily remain for varying and abnormal lengths of time entangled in folds of the gastric mucous membrane. The advantage of salol is that it mixes intimately with the stomach contents, and certainly accompanies its general movements. Salicyluric acid is easily recognised in the urine on the addition of neutral ferric chloride solution,

* Penzold and Faber, "Resorptionsfähigkeit des menschlichen Magens," *Berliner klin. Wochenschrift*, 1882, No. 21, p. 313.

which produces a violet colour. To detect the first traces, the urine is acidulated with hydrochloric acid and shaken with ether; the salicyluric acid is taken up by the ether and can easily be detected in the ether residue. More simple and no less certain is the plan of dipping a piece of filter paper into the urine and then letting a drop of ferric chloride fall on it. The edge of the drop becomes violet in the presence of the merest trace of salicyluric acid." In addition to the time at which the acid first appears in the urine, after administration of the salol, there is also the time during which it lasts. In healthy persons its excretion continues for twenty-four hours, while in patients with some impairment of the motor function of the stomach this may be protracted for forty-eight hours or longer.

In giving the above methods I have merely selected those which seemed simplest, surest, and sufficient for the more limited demands of a work whose chief aim is to deal with the surgical aspects of the subject. The reader therefore is referred to the first of Ewald's Lectures, from which the above abstracts have been taken, or to Clifford Allbutt's System of Medicine * for a more detailed description of the methods here briefly given: for a fuller criticism of such discrepancies as may arise in connection with them; and for an account of various methods for the detection and analysis of the other constituents of gastric juice and gastric digestion.

Physical examination.—There remain certain other means for ascertaining the state of the stomach—the so-called physical methods of examination. These are: palpation, percussion, auscultation, inflation, gastroscopy, and gastrodiaphany.

Palpation.—To examine the stomach through the parietes by means of the hand, considerable care is required to avoid throwing the abdominal muscles and particularly the recti into contraction. If the tips of the fingers are used, or if the hand be applied cold, a reflex spasm of the muscles is almost certain to be induced.

The patient, lying in the recumbent position, with the knees drawn up and the chest raised, should be enjoined to resist voluntarily any contraction of the abdominal muscles.

* Vol. iii. p. 288.

The palm of the hand and the entire palmar aspect of the fingers, previously warmed if necessary, should be placed flat on the abdomen. Then by a rotatory movement of the hand, coupled with gentle and gradual pressure exercised by the flexor surfaces of the terminal phalanges, both a superficial and deep examination can be made. In certain cases further information may be gained by palpating in the knee-elbow position. In all cases palpation is more efficiently carried out when the patient is under an anæsthetic. Vigorous palpation will elicit sounds of splashing when conditions exist favourable for its production.

Percussion.—As a method of examination percussion, as ordinarily practised, is of little diagnostic value. A tympanitic note may be heard, but in cases where the colon overlaps or is situated just below the stomach, it is not possible to distinguish where the one ends and the other begins. In a paper by R. A. Fleming * an attempt is made to show that by the combined methods of auscultation and percussion it is possible to delineate with a considerable degree of accuracy the lower boundary of the stomach. The stethoscope is applied to the stomach "in what has been called Traube's area, *i.e.*, to the left of the mid-abdominal line and between the free edge of the left lobe of the liver and the costal margin—where, in most cases, the stomach is in direct contact with the abdominal wall. But if some suspicion exists as to whether colon or stomach underlies this area, the stethoscope may be placed between the left border of the xiphoid cartilage and the costal margin. This of necessity means auscultating through the thin edge of the left lobe of the liver, but, notwithstanding, the sound produced by the percussing finger is very clearly conveyed to the ear. . . . In all the cases tested, I used both the finger and also an ivory pleximeter and percussed with one finger. A note, probably stomach, was obtained by percussing close to the stethoscope; and then by commencing (on the left side of the abdomen) below the umbilicus, or, in cases of suspected dilatation, as low as the symphysis, the stomach note could be at once detected by the auscultating ear whenever the stroke was made over it, even though the colon overlapped. Great care was taken to percuss vertically

* *Edinburgh Hospital Reports*, 1893, vol. i. p. 69.

downwards, and the patient was always in the recumbent posture."

Auscultation.—Apart from its use in conjunction with percussion, auscultation is of little value as a diagnostic means. Unlike the œsophagus, there is no constant or typical sound produced by movements of the contents of the stomach, and such sound as has been noted—that is, that produced by the passage of food through the cardiac orifice into the stomach—is both uncertain and wanting in constancy of character. In cases, however, of serious obstruction at the cardiac orifice, there will be complete absence of any sound.

Succussion.—This method of examination consists in giving the trunk a shake laterally, when a sound of splashing is heard, if gas and fluid are present to any extent. It is a symptom which is usually met with when the stomach is dilated.

Inflation or Distension.—In cases where it is necessary to ascertain the size and position of the stomach, the viscus is inflated with gas. There are different ways of doing this. One of the simplest is to insert the stomach tube, attach to its free end the bellows of an ordinary rectal enema injector, and then pump in air. When the patient, or the stomach, can no longer endure any increase in the distension, the air will escape by the side of the tube, and this it will usually do more readily than pass into the duodenum. As the stomach distends, it will produce a visible fulness in the epigastric region, producing a prominence proportionate to the size of the stomach and the thinness and laxity of the abdominal parietes. The method of inflation alone does not, however, entirely get over the difficulty of distinguishing a dilated stomach filled with air from the transverse colon distended with gas The following method, adopted by Dehio and recommended by Ewald,* appears to obviate this difficulty. "The patient must drink at intervals four quarter-litres of water, so that he takes a whole litre in four portions. If after each quarter-litre has been taken the limits between the lower semicircular dulness and the distended transverse colon be clearly ascertained by means of

* *Lectures on Diseases of the Stomach*, vol. ii., New Sydenham Society, 1892.

percussion, these limits in a healthy patient, when he is in a standing position, may be seen, in proportion to the fluid poured into the stomach, to advance downwards to about a few centimetres above the umbilicus, but never below it. When the patient is lying down, tympanitic resonance, caused by the air which is swallowed at the same time as the water, takes the place of the dulness, and this prompt change of sound is a certain proof that it is the stomach and not the bowel."

In marked cases of dilatation following upon obstruction at the pylorus, it is sometimes sufficient to pour in through a stomach tube some pints of warm water. The extreme emaciation which usually accompanies these conditions admits of the distension of the stomach, and the descent of its greater curvature being visibly observed and easily determined by palpation. The patient should be in the sitting or standing position.

Gastroscopy.—With regard to this method of investigation, all that can be said is that it has been attempted. Leiter has constructed a gastroscope, and Mikulicz* has employed it with some measure of success.

Gastrodiaphany.—Like the above, this method of examination has received up to the present but a very limited trial. Its use has, however, been attended with success, and Solis-Cohen† speaks of having used the gastrodiaphane "with satisfaction." This author thus describes Einhorn's method of translumination or gastrodiaphany: "The patient, fasting, drinks one or two glassfuls of water, and the apparatus (consisting of an electric lamp, attached to a soft-rubber tube containing the connecting wires), lubricated with glycerine, is then inserted (or rather swallowed). In a dark room, the patient being either in a standing or lying position, a reddish luminous zone upon the abdomen indicates the outline and position of the stomach. Thickening of the anterior wall, as by neoplasm, obscures or prevents the illumination. The method is especially valuable in delimiting the lesser curvature in gastrectasia and gastroptosis. Hering and Reichmann's lamp described by Renvers and Pariser at the Berlin Medical Society, appears to be larger

* *Wiener med. Wochenschrift*, 1883, vol. xxxiii. p. 748.
† *Annual of the Universal Medical Sciences*, 1893, vol. i. C—9.

than that of Einhorn, and is covered by a small glass vase filled with water. They wash out the stomach and introduce one and a half to two litres of water before inserting the lamp. The patient must be standing, as the full stomach falls away from the abdominal wall. A case of carcinoma was thus diagnosticated and confirmed by section. The tumour appeared as a dark spot in a light field."

Skiagraphy.—Quite recently the Roentgen rays have been used for purposes of diagnosis in certain gastric conditions; and it is not improbable that the near future will enable us to obtain shadow photographs of tumours of this region just as we can at present ascertain the existence of foreign bodies in the cavity.

CHAPTER XV.

INJURIES: CONTUSION, TRAUMATIC RUPTURE, TRAUMATIC PERFORATION, GUNSHOT WOUND.

Contusions.—Cases of uncomplicated contusions of the stomach are rare. It is more usual for the injury which produces the contusion to inflict at the same time some graver lesion elsewhere, with the result that the symptoms which might be sufficient to indicate the stomach mischief are more than obscured by the severity of those arising from the damage to other parts.

When the injury to the stomach wall has been sufficiently severe, some after effects may result. Thus either an acute or chronic inflammatory process may be set up, the patient suffering from symptoms of an acute or chronic gastritis. While the symptoms of these affections will be best learnt by a reference to the same conditions as they arise from other causes and are fully described in books on medicine, the surgeon should be familiar with a few of the more prominent manifestations. In acute gastritis there is pain in the epigastrium, frequently of an intermittent character and augmented by the ingestion of food. Pressure with the

hand in the left hypochondrium may cause a feeling of tenderness; and deep inspiration may also cause distress from pressure of the diaphragm downwards. Various febrile disturbances may be present, such as rise of temperature, rapid pulse, thirst, scanty urine, nausea, and constipation.

When the inflammation assumes a more chronic character, dyspeptic symptoms will arise. In two recorded instances an abscess formed which subsequently burst and gave rise to fistula.

It must be remembered that it is not always easy to distinguish between symptoms arising from inflammation of the peritoneum and those due to a like condition of the stomach.

Treatment.—At whatever stage of the affection, whether early—that is, shortly after the accident—or later when inflammatory mischief has become manifest, rest must be procured for the injured or diseased organ. Strength must be sustained as much as possible by the administration of nutrient enemata; and when it is found necessary to give food by the mouth, this should be of a kind to entail as little functional activity of the organ as possible. The foods chosen should be easily digestible, non-irritant, nutritious, and given in small quantities frequently.

Ruptures.—As in the case of contusions, rupture is very frequently associated with other lesions. In the only case which I have seen, that of a boy admitted under my care in the Victoria Infirmary, the spleen was also ruptured; and in most of the recorded cases this is the organ that usually suffers. Next in order of frequency comes the liver. When the injury is of a more widely distributed character, other viscera are involved, and the bowel may be ruptured as well.

The nature of the ruptures varies. In some cases only the peritoneal coat is severed, in others only the mucous, while in all cases of any severity the entire wall is divided. The lesion may be located in any part and may be of any extent, and, further, there may be more than one lesion. In some very severe instances the organ has been torn completely through. In such cases the injuries appear to involve most frequently the pyloric region. The extent of the lesion is largely determined by the amount of distension at the time of the injury.

Traumatic ruptures result either from a severe blow in the epigastric and left hypochondriac regions, or, as is more frequently the case, from a tight squeeze; or from a crush such as is produced by the passage of a wheel of a heavy vehicle over the body.

Symptoms.—An injury sufficiently severe to cause a complete rupture of the stomach gives rise to symptoms of more or less profound collapse. Great pain is complained of in the upper part of the abdomen, coupled with vomiting in which the ejecta may or may not contain blood. If death does not ensue shortly after the accident, some temporary rallying may take place; but the patient, after a variable period of restlessness and great suffering, sinks again into a state of collapse terminating in death.

In the less severe forms of injury, where the rent may only have involved the serous or mucous coat, or the complete rupture has been too slight to admit of any escape of the gastric contents, the symptoms will be less marked. The primary collapse may be comparatively slight, and the patient, when once well out of the immediate shock, may make an uninterrupted recovery. It is, however, in these milder forms of injury that secondary and later complications may sometimes arise. Thus, in a case recorded by Limont and Page,* cicatricial contraction resulted in the region of the pylorus after a blow received seventeen years previously. In other instances an abscess may form at the seat of lesion and, bursting externally, give rise to a gastric fistula.

Treatment.—The profound shock which usually exists in severe cases renders out of the question all considerations other than those directed to the patient's collapsed condition. However strong may be the evidences of rupture of the stomach, it would only be cutting the last thread of life to venture upon anything operative at this critical period. Every endeavour should therefore be made to rally the patient. Warmth should be freely applied all over the body, and warm brandy enemata administered. So soon as there is distinct indication of the patient's strength increasing, as shown by a better pulse, there is nothing but harm

* *Lancet*, 1892, vol. ii. p. 84; also *Brit. Med. Journ.* 1893, vol. ii. p. 427.

to be gained by delaying an operation. The cases are by far too few to admit of any definite statement being made as to what should be done; we only know that in a bad case of rupture death will certainly, in most if not in all instances, ensue; while we equally know that to open the abdominal cavity, properly cleanse it, and stitch up any rent discoverable in the gastric wall, is neither a grave nor long operation, and a mode of procedure which has proved successful in injuries of a similar nature to the intestine. But for the frequency of severe injury to other parts, there is no reason why an early operation, performed as above indicated, should not prove as successful in rupture from accident as in perforation from disease.

Penetrating wounds.—As the result of a stab from a knife, foil, or sword, the stomach may be punctured. The gravity of the penetration depends upon the direction of the wound, its size, and the condition of the stomach at the time. Thus a small wound, or one which is oblique in its transfixion of the gastric wall, inflicted upon an undistended organ will be far less severe than where the opposite conditions exist. The contraction of the stomach wall is capable of occluding a small opening, and still more so when it is oblique, so that any escape of material from the stomach cavity is prevented. With the exception of the escape of foods, &c., into the peritoneal cavity, the only other complication of any gravity is hæmorrhage, the bleeding sometimes being excessively free from the wound in the wall of the stomach.

Symptoms.—The most convincing proof that the stomach has been penetrated is the escape of its contents through the external abdominal wound. This, however, is unfortunately exceptional, and the diagnosis has to be often made on much less certain evidence. The position of the external wound and the nature of the weapon producing the injury should substantially assist in arriving at a correct conclusion, especially when coupled with vomiting and the presence of blood in the vomit. There is usually at the outset considerable shock, combined with an expression of great anxiety, cold sweats, and pain of an unremittent character radiating from the seat of injury. At a later stage, in cases of escape of the gastric contents into the peritoneal cavity, symptoms of acute peritonitis will arise.

Treatment.—What has been already stated in connection with the treatment of cases of ruptured stomach is equally applicable here. The early shock should be first dealt with, and then, so soon as the patient seems to have regained sufficient strength, no delay should be exercised in opening the abdomen, cleansing its cavity of any extravasated material, suturing the stomach wound, and reuniting the abdominal incision. In those cases where the symptoms are slight and it is believed that the wound is small, the utmost rest should be enjoined. If nature is to effect an unassisted cure it will be by adhesion of the wound to neighbouring parts, so that everything must be done to keep the patient quiet in bed, and the stomach free from any functional activity. To relieve pain a hypodermic injection of morphia may be given, or a few drops of laudanum added to the nutrient enema. Nothing should be given by the mouth for at least forty-eight hours; and if thirst be very troublesome it will be alleviated by rectal injections of warm water.

Gunshot wounds.—It is comparatively rarely that this form of penetrating wound comes under the observation of the civil surgeon. The fact, however, that an occasional case crops up in our general hospitals renders it necessary to refer briefly to the subject.

The nature of the wound, although of a penetrating character, differs somewhat from those just discussed. A bullet does not cause a clean-cut wound, but in its transit destroys a certain amount of tissue. Hence, if it pass through the gastric parietes into the cavity of the stomach, it leaves a track which is much more liable to admit of the escape of the contents of the stomach than in the case of a clean incised wound.

The symptoms connected with a gunshot wound are very much like those already described in connection with a penetrating one. The hæmorrhage from the stomach is sometimes severe, and the blood-stained condition of the vomit is the best evidence that that viscus or possibly the duodenum has been penetrated.

The danger of extravasation into the peritoneal cavity is so great in this class of wounds that surgeons are now generally of opinion that an exploratory laparotomy should not be delayed after the first symptoms of shock have subsided.

The injury, according to all military records, is excessively fatal when allowed to pass untreated; so that where these cases happen in civil practice, we should not delay in using the comparatively perfect means we have at our disposal in our general hospitals. The wound in the stomach, or perchance in the duodenum, should be carefully sought for, and when found accurately sutured. The abdominal cavity should be thoroughly cleansed from any extravasated material by freely flushing it with warm normal saline solution; or if this is sufficiently scanty, it may be simply wiped away. It should be remembered in searching for the lesion that there may be two openings—one of entrance and the other of exit—both of which must be closed. As in the case of other penetrating wounds, fistulæ have been known to result from those due to gunshot injury. The case of Alexis St. Martin is too well known to need anything further than simply mentioning as an illustration.

CHAPTER XVI.

FOREIGN BODIES. GASTROLITHS. HAIR CONCRETIONS.

Foreign bodies.—Solid substances incapable of being digested, or only acted upon to a limited extent by the gastric juice, and of such a size and shape as to be impassable, or passable only with difficulty through the pylorus, constitute what may be broadly termed "foreign bodies in the stomach." As a more literal meaning of the term, the word "foreign" also implies substances in the stomach which are abnormal in that situation.

As in the case of œsophageal foreign bodies, there is no limit to the list of solid substances which may be swallowed and constitute a similar class of foreign bodies in the stomach. Taken, however, as a class of cases, they are far less frequently met with. They manifest, too, in their symptoms, usually much less urgency and severity; and while œsophageal impactions are almost always associated

with symptoms of some kind, it not infrequently happens that a foreign body may remain in the stomach without causing anything but the slightest gastric disturbance.

The causes of a body being detained are to be found in the foreign body itself, and in the stomach. In the former case it is the size of the body, or its size coupled with its shape and consistency; in the latter it is the large size of the cavity in which it is lodged, and the comparatively small constricted orifice through which it is required to pass. It might be to some extent reasonably assumed that what could pass through the cardiac orifice would also pass through the pyloric, and such would doubtless be the case could the body maintain a similar disposition of its axis to that which it had in entering the cavity. A large object, however, is almost certain to change its axis after it has passed through the cardiac aperture, and such an alteration may render it a physical impossibility that it should be able to leave the stomach by the pylorus. Again, there are some structures which neither from their size nor irregular shape would give rise to trouble, but, being sharp-pointed, are liable to become engaged in the mucous folds and, from the active contractions of the stomach, be driven inextricably into the coats of the viscus.

Symptoms.—Considerable variations exist in the symptoms which arise when a body becomes retained in the stomach. At the two extremes we have on the one hand an almost entire absence of symptoms, on the other manifestations of the most acute suffering and anxiety. Pain, when experienced, varies in its kind and in its intensity, in its locality, and in its duration. A determining factor in the patient's sufferings is the nature of the body present. Thus when, for instance, this consists of a solid lump of metal, a sense of weight or oppression is experienced in the epigastric region; when of an irregular or sharp-pointed material, capable of injuring the mucous membrane, pain of an acute character is felt. The pain experienced may be circumscribed or localised, felt in front, at the side, or behind. It may radiate and appear more diffused. In some cases it is increased by taking food, due in all probability to the increased peristaltic action induced by ingestion. In other cases it is diminished, when the explanation seems to be that the distension of the viscus

removes temporarily the wall of the stomach from contact with the irritating foreign body. Pressure applied externally sometimes causes pain; and in a similar way respiration, for the diaphragm descends in each inspiration and presses upon the stomach from above. In some instances the pain partakes somewhat of a spasmodic character. At one time free from all feeling of discomfort, at another the patient is seized with pains of excessive acuteness and intensity. Vomiting is not a constant symptom, but when present and the ejecta are tinged with blood, laceration of the mucous membrane is probable.

Besides these local symptoms of pain and occasional vomiting, more generalised symptoms will be present, and these more or less in proportion to the severity of the former. In the severer cases there may be great anxiety, sleeplessness, anorexia, thirst, emaciation, and other conditions dependent upon a disordered digestion and an insufficiency of nourishment. There may be constipation or diarrhœa.

In cases of prolonged retention without great severity of the symptoms at the outset, secondary complications may arise. Perforation of the stomach may take place. If no adhesions have previously formed, acute peritonitis will ensue; if, on the other hand, the stomach has become adherent to the abdominal wall, the process of ulceration which is going on may lead either to the formation of an abscess or more directly to a perforation of the skin—in both instances the result would be a gastric fistula.

Diagnosis.—The most important factor in diagnosis is the history of the case. Without the previous knowledge that a foreign body has been swallowed, it is practically impossible to state from the symptoms the nature of their true cause.

The majority of the cases in which this accident is found are either lunatics, drunkards, or children, just such as refuse, or are incapable of giving, the information most needed. With, however, a history, the accompanying symptoms will readily support the truth of the patient's statement, and little doubt will exist in the surgeon's mind that the sufferings experienced are dependent on the retention of a foreign body in the stomach.

In exceptional cases, and with certain kinds of foreign bodies, it is possible to obtain evidence of their presence in special ways.

In one or two instances the "body" has been palpated through the abdominal wall. It is sometimes possible to strike the substance within the stomach by the passage of œsophageal sound.

In cases of metallic bodies various ingenious methods have been tried: thus, the administration of about 20 drops of hydrochloric acid, the subsequent withdrawal of the stomach contents; and its reaction to the Prussian blue test, has proved the presence of iron. Or, again, the deflection of a delicate magnetic needle when placed over the epigastrium. But all these methods are now completely displaced by the use of the Roentgen rays, by means of which it is possible not only to ascertain the existence of a foreign body (assuming it to be one which will obstruct the rays), but to ascertain its exact position and its shape.

Prognosis.—One of four things must happen: (1) the "body" will be ejected through the mouth; (2) it will pass through the pyloris; (3) it will remain an indefinite time in the stomach; (4) it will work its way through the stomach, producing sudden symptoms of perforative peritonitis, or more slowly make its exit somewhere through the skin. Of these, the commonest result most fortunately is the ultimate passage of the body through the pylorus. It need hardly be said that before any opinion can be expressed as to the probable course a foreign body will take, there must first exist an accurate knowledge of the nature of the body swallowed. Given two cases, in one of which a fork has been swallowed, and in the other a coin, it would be reasonable to expect that the coin might pass through the pylorus, but it would be very doubtful whether such a course would be taken by the fork.

The two practical questions which the surgeon has to consider are, first, whether there is a chance of the foreign body making its way out of the body *per vias naturales*, with the assistance possibly of some medicinal or dietetic measures; or, secondly, whether the only chance of removal must be by operation. This naturally leads to the question of treatment.

Treatment.—The conservative measures consist in attempting to get the body ejected by the mouth or passed on into the bowel; the operative, in the extraction of the body by gastrotomy.

With regard to attempts to remove the "body" through the mouth, there are comparatively few cases in which it would be wise to induce emesis of a character more frequent and more energetic than that which may possibly exist as a symptom The nature of the substance will determine the question whether or not the trial should be made. It can easily be understood that to attempt by this means to remove a body which has passed perhaps with difficulty into the stomach, is only likely to court the greater danger of its becoming seriously impacted in the œsophagus.

Endeavours to get the body to take the natural course of exit through the pylorus must entail considerations which affect, on the one hand, the patient, and on the other the foreign body itself within the stomach. Recumbency should be enforced, and the patient made to lie as much as possible on the right side, in order to place the pyloric orifice in the most dependent position. Any pain, spasms, or gastric irritability should be relieved by the administration of narcotics, preferably opium. The nourishment of the patient forms an essential part of the process of cure. Substances are given which will be likely either to form a mass with the "body," and so dilate the pyloric orifice sufficiently to admit of its passing; or to lubricate it, or entangle it in such a way that in both instances its onward passage will be facilitated. Among the first class are potatoes, constituting the well-known potato cure; rice, porridge, &c.; among the latter are oils, fats, and thick glutinous drinks. As an example of the nature of entangling the object in some shreddy material, may be mentioned a case recorded by Dickson.* The patient, a lady, had swallowed a plate of false teeth during the night. She was made to swallow a small amount of oakum and a large number of figs and raisins. The treatment was continued for a week, when she suddenly felt relief, and a few hours afterwards passed the teeth *per anum*. The

* *Edinburgh Med. Journ.* 1876, p. 839.

irregularities of the false teeth were found to have been rendered somewhat smoother by the oakum and bits of figs, which had become adherent to them.

Our last, and it may be said our best, resource in treatment is by operation, and surgeons nowadays would prefer to make use of this comparatively safe procedure to spending time in trying conservative measures which in most instances must hold out a very doubtful result. The operation of gastrotomy has now been frequently performed for the extraction of foreign bodies, and, so far as the recorded cases are concerned, with almost unbroken success. Little hesitation therefore need exist in the mind of the surgeon as to the right course of action to adopt when once he is satisfied that there is a poor chance of the foreign body finding a speedy exit by any other means.

Gastroliths and hair tumours.—These are two forms of foreign bodies which deserve separate notice. They are of the nature of concretions, and owe their origin and existence to the special conditions under which they are formed.

Gastroliths.—Little is known as to the real origin of these bodies. In some cases it would appear that the nucleus is formed of hair, and around this has been built up a structure of vegetable material. In other cases no such definite form of a nucleus is observable. In one reported case the mass weighed twenty-eight ounces, no nucleus was present, and on microscopical examination it was found to be composed of starch granules, plant tissues, cells, and vascular bundles containing chlorophyll.

Hair tumours.—Tumours composed entirely of hair are more frequently met with than gastroliths. Not a few have now been recorded. They mostly occur in women, and in those who at an early period of life were addicted, either from a simple habit or from a belief of some purifying effect upon the tongue, to biting the tips of their hair. Balls of various sizes have been found, weighing from a few ounces up to as much as five pounds. If not removed, one of the commonest results of their retention is to produce ulceration and perforation, followed by fatal peritonitis.

Symptoms.—These present considerable variety, but are mostly connected with some form of gastric disburbance. The patient may suffer from nausea, vomiting, anorexia

with consecutive emaciation, weakness, aud exhaustion; there may be marked dyspnœa. In most cases there appears to have been a total absence of symptoms at an early stage; it is only when the mass has increased to a considerable size that indications of some gastric irritation manifest themselves. When the mass reaches a sufficient size it can be felt as a movable tumour through the parietes. Pain is a variable symptom both in its intensity and in its frequency.

Diagnosis.—There is nothing sufficiently distinctive about the symptoms to lead one to surmise the nature of their true cause. When it has been possible to feel a tumour by abdominal palpation, it has usually been diagnosed as a malignant growth; its mobility, however, is an important distinguishing feature. In all the cases recorded there has been a history in early life of swallowing hair, either the patient's own, or that of certain animals; in some instances with an intentional object, in others through a careless habit; in more than one case the practice has been continued on into adult years. The previous knowledge of such a habit with the co-existence of a tumour in the gastric region should excite a suspicion as to the possible nature of the complaint.

Treatment.—The only treatment is removal by gastrotomy.

CHAPTER XVII.

DISEASE. ULCER.

Unlike disease of the œsophagus, there are comparatively few of the various complaints which affect the stomach that call for any consideration or interference on the part of the surgeon. In the case of the œsophagus it has been shown that disease, whether inflammatory or non-inflammatory, is almost certain to give rise to symptoms of an obstructive character, and these, if they do not actually call for surgical interference, will very frequently require a

surgeon's opinion. In dealing therefore with diseases of the stomach, only such will be discussed as are likely to call for surgical treatment. It would be supererogatory to trench upon ground which in more than one sense is so essentially within the domain of the physician. In almost every case it is the physician who first sees and diagnoses these forms of disease. The surgeon's opinion is required not so much to discuss the nature of the disease, as to state what he is prepared to do, how he will do it, and with what possible result.

It is only within the last few years that the surgeon has come to the assistance of the physician in the treatment of certain diseases of the stomach. It may therefore be said that, reasoning in the light of the successful incursions made by surgery in other departments of medicine, there yet exists a sphere of labour for the surgeon far beyond his present limited field of operation. It is not, I think, too venturesome to predict that the day is not far distant when the stomach will be opened, explored, and resutured *for purely diagnostic purposes* with as much freedom and security as is now done, for instance, in the case of the brain. At the commencement of the year 1899 I read a paper before the Glasgow Medico-Chirurgical Society, which was subsequently published in the *Lancet*,* on "The Value of Exploratory Operations on the Stomach." In it I gave illustrations of cases with obstinate gastric symptoms which had been greatly relieved and in some instances cured by the performance of an exploratory operation. Since then I have had other cases where prolonged treatment by medicine and lavage had proved futile, but where an exploratory operation had cleared up the diagnosis and permitted the adoption of remedial measures. I may mention one very striking instance of a man who for four years had lived a life of misery, and had had every possible kind of gastric drug. He was emaciated, and vomited almost everything he took. I opened the abdomen, and found the stomach bound by adhesions to the undersurface of the liver. Some of these were easily detached, but a dense inseparable mass existed at one spot. I then opened the stomach, and found a deep sulcated ulcer

* 1899, vol. i. p. 952.

apparently quite healed, but its floor formed by the liver. As this could not be dealt with, I proceeded to perform a posterior gastro-jejunostomy. The man made an uneventful recovery, lost all his pain and digestive troubles, and rapidly put on weight. Now in this case the early symptoms and even the later rendered it quite impossible to diagnose the nature of the man's complaint. He was treated for chronic gastric catarrh, like, I have no doubt, hundreds of other cases are, and would have gone on, I suppose, for years longer, living a life of incapacity and wretchedness. My sole contention was, and is, that we should not go on indefinitely striving to cure, by simple remedial measures, diseases of the stomach, as to the true nature of which we are in doubt, but should submit the patients to an exploratory operation. It is reasonable to believe that if physicians and practitioners would more frequently submit this class of cases to surgical treatment, many a case of malignant tumour or ulcer of the stomach could be successfully excised at an early period of its existence, and a complete and permanent cure effected.

The diseases, or certain phases of them, which up to the present time have received some form of surgical treatment are—ulcer, carcinoma and other tumours, stenosis of the pylorus, dilatation, and certain conditions, such as result from external pressure, as in the case of tumours, or from distortion, as affected by adhesions. These will now be discussed in the order here given.

Ulcer.—While, for reasons above stated, it is unnecessary for the surgeon to be acquainted with all the symptoms which indicate ulcer of the stomach, it is of some importance that he should be familiar with certain pathological aspects of the disease. The first consideration worthy of his attention concerns the ulcer itself, and the second the various complications which may arise in connection with it.

Excluding ulcers the result of traumatism, and such rarer forms as are sometimes associated with syphilis and tuberculosis, the forms to be dealt with here are the so-called simple or chronic ulcer of the stomach, and the acute or perforative. Whether or not these two forms are really to be distinguished from each other there is still ground for speculation. Those who maintain a distinction, believe that the chronic form is the one most frequently met with in

men in later life; while the acute perforative ulcer is that more often seen in young chlorotic women. The distinction, however, is hardly one which concerns the surgeon, as, for all practical surgical purposes, the treatment of both forms of ulcer and the later complications are the same. In all, therefore, which follows it may be taken that either one or the other is included in the discussion.

As most frequently met with, the ulcer measures a little less than an inch in diameter; much variation, however, exists, some being two or more inches in breadth. It presents a somewhat punched-out appearance, with more or less thickened edges, and a base which is thin or thick in proportion to the depth to which ulceration has taken place and adhesions have formed. In situation the ulcer is most frequently found either at the greater curvature or somewhere close to the pylorus. It is much less frequently met with on either the anterior or posterior wall, and least often at the cardiac orifice.

In the process of healing considerable contractions sometimes take place, leaving fibrous bands with intervening cul-de-sacs. The most serious results which may accrue from cicatrisation are those connected with a distortion or contraction of the pylorus. This complication will be more particularly referred to later.

In the opposite process, that of progressive ulceration, one or more of several issues may happen, depending chiefly on the situation of the ulcer and the acuteness of the process. In any case perforation of the stomach will take place. When the process is slow, adhesions are contracted between the floor of the ulcer and neighbouring structures. On the other hand, when ulceration progresses rapidly, a communication is established between the cavity of the stomach and the general abdominal cavity, with all the untoward results which accrue from such a connection.

When once the stomach wall is perforated, and the floor of the ulcer formed by neighbouring organs to which it has become adherent, one or two conditions will result—that is, supposing the ulcerative process is progressive—either a fistulous opening will be established between the stomach and a neighbouring viscus, or an abscess will be formed which may rupture, and thus cause indirectly complications similar to those arising from progressive ulceration

independent of suppuration. As to what organs may be involved in one or other of these processes is merely a matter of anatomical detail. Suffice it to say that instances have been recorded illustrative of involvement of every part —viscus or cavity—with which the stomach has anatomical relations.

In discussing those aspects of ulcer of the stomach which may be said to possess features of some surgical interest, it may be well for me to preface my remarks with a few words of caution. The disease is one that in most of its aspects essentially requires rest and not interference. Hence it is only when all reasonable conservative measures have been applied without avail that the physician should consult the surgeon, and the latter should be prepared to act. The following events in the life history of the disease may be said to be worthy of the surgeon's attention : (1) *The character of the ulcer ;* (2) *the occurrence of excessive hæmorrhage ;* (3) *perforation into the peritoneal cavity ;* (4) *formation of abscess ;* (5) *fistulous communications ;* (6) *adhesions ;* (7) *internal contraction ;* (8) *pyloric stenosis.*

1. **Regarding the character of the ulcer.**—So far as the ulcer itself is concerned, the surgeon's interest centres upon the possibility of its removal. Whether such a question in treatment is to be entertained is one for the physician originally to decide.

Assuming that the chronicity of the case and other features suggest the advisability of the endeavour, the surgeon will be assisted in his opinion as to its practicability by some knowledge as to the situation of the ulcer. When located near the pylorus, it is in some instances possible to detect a tumour. It may be incidentally remarked here that mistaken diagnoses have not infrequently been made from always connecting a swelling or tumour in the region of the pylorus with carcinoma of that region. Numerous cases are recorded to show what an amount of inflammatory thickening is sometimes associated with ulcer near the pylorus. The detection, therefore, of such a tumour in this region should not be allowed to mislead when the earlier symptoms unmistakably point to ulcer. When the ulcer is situated in any other part of the stomach, it is very rarely possible to detect its existence by palpation through the abdominal parietes.

Ord* thinks that the time at which pain occurs after taking food may throw some light upon the position of the ulcer. Thus when it arises shortly after taking food, or even during a meal, the ulcer is probably in the cardiac region of the stomach. When occurring later, pain in all probability marks increasing distance in the position of the ulcer from the cardiac orifice. Other conditions, however, affecting the patient and the stomach generally have to be taken into account in considering the relative value of pain with reference to the localisation of the ulcer. The co-existence, for instance, of simple hyperæsthesia, or catarrh, would in all probability give rise to considerable discomfort, amounting not infrequently to pain, immediately after food entered the stomach.

Again, the period at which vomiting occurs after ingestion may to some extent indicate the position of the ulcer. Early vomiting after food may indicate implication of the cardiac region; but when occurring later, and still more when it arises after several successive meals, the ulcer may be considered as located in the pyloric region. The attitude of patients during the paroxysms of pain is also sometimes helpful in suggesting the seat of the lesion. Thus the patient will likely assume such a position as will tend to obviate the pressure and irritating effect of the ingesta upon the ulcer. The dorsal position would be that likely to be adopted by a patient with an ulcer located on the anterior wall of the stomach, and *vice versâ*. Similarly a patient might find greater relief in lying on the left side when the ulcer is situated about the pylorus, and *vice versâ*.

With all the aid, however, that can be derived from such suggestive symptoms, the only absolutely certain knowledge of the situation of the ulcer, and the possibility of its removal can be obtained from an exploratory laparotomy. For although we may approach beforehand to within a measurable distance of practical certainty as to the situation of the ulcer, it still remains impossible for us to decide, prior to operation, whether there are or are not adhesions of such a character as renders removal impracticable. Again, there is always the possibility of more than one ulcer being present. (See Fig. 13.)

* *International Journal of the Medical Sciences*, 1889, vol. i. p. 552

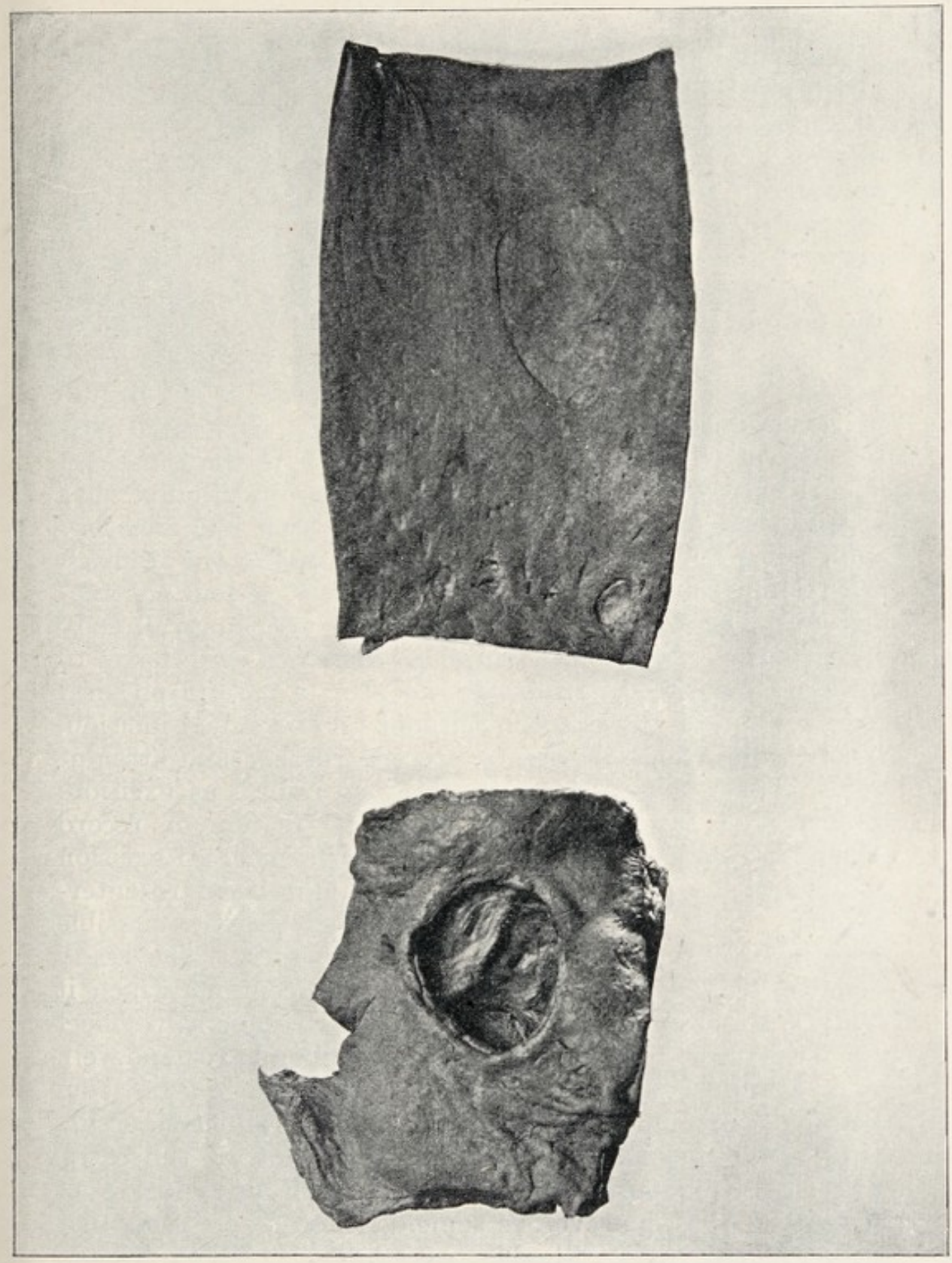


FIG. 13.—PERFORATION ULCERS OF STOMACH.—The two parts were removed from the same organ. The upper shows the flattened slightly depressed cicatrix of a large healed ulcer, and cicatrices of smaller ones. The lower shows a deeply excavated ulcer which had caused death by perforation into the peritoneal cavity. (*W.I.M. Glas.*)

Assuming that the ulcer is single, suitably located, and not inseparably connected with any important structures, its successful removal may fairly be entertained. The conditions, however, with which the surgeon is almost always more likely to be confronted are not those most favourable for the success of his operation, but just those where the greatest difficulties are liable to exist. Thus it is only after protracted endeavour by various conservative measures, and the failure of these, that his aid is called in, and then he has to deal with an ulcer which will only too likely be, if not extensive in area, at least very extensive in the results it has produced in its immediate vicinity. If located posteriorly, it will be intimately bound down to the pancreas; if near the pylorus, there will be possibly contortion of that orifice, with probably some obstruction from inflammatory infiltration and induration; and if in a part of the stomach where the relations of the latter are freer, serious contraction and alterations in the shape of the viscus may already have taken place. The surgeon therefore will have to decide, from the conditions found after a careful physical examination of the stomach through an abdominal incision, whether he deems it wise to proceed further and attempt some plastic operation or anything so radical as excision. Suffice it to say that not a few cases are now on record where successful excisions have been performed. If excision is not feasibly practical, the next best thing is gastro-enterostomy. This has been practised with the greatest possible success by Czerny,* who warmly advocates it. The ready removal of the usual hyperacid stomach contents which it admits, seems to have a very restful and recuperative effect upon the ulcer. Patients thus operated upon have done well.

2. **Excessive hæmorrhage.**—Hæmorrhage is far from being a constant symptom in ulcer of the stomach, occurring apparently in less than fifty per cent. of the cases. Still less frequently does it occur with any degree of severity. It is, however, in some of these severe cases that surgery may lend valuable assistance. "When violent hæmorrhage," says Ewald, "has once set in, the danger of its recurrence hangs like the sword of Damocles over the head of the patient." Fatal hæmorrhage appears to be

* *Deut. med Woch.*, June 15 and 22, 1899

comparatively rare, and possibly in many, if not in most, of these cases death will be unpreventable, whatever the measures employed. It is unlikely that when either the splenic artery or the portal vein has been opened into, and still more so when the left ventricle of the heart has been perforated, that any means at our disposal, medical or surgical, could prevent an untoward result. Short, however, of hæmorrhage from such sources, where death must rapidly ensue, severe bleeding from smaller vessels with serious symptoms might reasonably be dealt with by the same means now frequently employed for losses of large quantities of blood due to various other causes. Since Wooldridge's original paper, transfusion has been simplified to such an extent that no patient suffering from loss of blood, no matter what the cause, should be allowed to die without such a simple measure as here advocated. All that is required is a small cannula for insertion into a vein, an indiarubber tube about a couple of feet long, one end of which is attached to the cannula, the other to the nozzle of the filler or funnel. A quantity of so-called normal saline solution is taken—that is, water (sterilised if possible) at a temperature of from 105° to 110° F. and containing a teaspoonful of common table salt to a pint of the fluid. This is poured into the glass receptacle and allowed to flow slowly into the vein. From one to five or six pints may thus with perfect safety be passed into the patient's circulation, provided all the necessary surgical precautions are taken in reference to treatment of the wound and the introduction of the fluid. It is also in this class of case that Czerny recommends the performance of gastro-enterostomy.

3. **Perforation.**—As here used, perforation is intended to imply a more or less direct communication between the cavity of the stomach and the general peritoneal cavity. With the exception of sudden and severe hæmorrhage there is no complication of gastric ulcer more serious to deal with. While the accident is not inevitably a fatal one, it is so in the large majority of cases. The rapidity also with which a fatal issue ensues is second only to that of excessive hæmorrhage. In Fagge's experience nearly all the cases of perforating ulcer were fatal in less than twenty-four hours.

The question therefore of treatment in this particular complication does not admit of much time being spent in

its consideration. Whatever is to be done will have to be done quickly, and experience so far goes to prove that success depends chiefly upon the shortness of the time which is allowed to intervene between the onset of the acute symptoms and the performance of the operation.

That the acute symptoms of perforative peritonitis with which the patient is suddenly struck down owe their origin to the rupture of a gastric ulcer is often purely conjectural. As pointed out by Treves * in his Lettsomian Lectures on Peritonitis, "All quite acute troubles within the abdomen commence with the same train of symptoms. . . . Until many hours have elapsed it is often impossible to say whether a sudden abdominal crisis is due to the perforation of a vermiform appendix, or to the bursting of a pyosalpinx, or to the strangulation of a loop of intestine, or to the passage of a gall stone." It might be reasonably supposed that the previous history of the case would always lend a sufficient aid towards the detection of the true cause. Unfortunately in many of these cases there is no early history of ulcer; the patient has been completely free, or almost so, from any gastric disturbance until suddenly seized with severe symptoms. The difficulties which the surgeon may have to encounter in his treatment are no less than those which the physician has in arriving at a correct diagnosis. It is not possible beforehand to localise the seat of the perforation, to define its limits, or to say how it will have to be dealt with when discovered; neither is it within his power to say whether the condition of general peritonitis which has arisen is too far advanced to be recovered from.

The following may be taken as some of the symptoms most frequently met with. The patient has usually no special warning, except that previously there may have been some exaggeration of the dyspeptic trouble. Sudden pain of such an agonising character causes the patient to cry out for relief. It is usually felt in the epigastrium, but soon extends over the abdomen. Collapse very rapidly follows, and with it often some abatement of the acute suffering. The face then becomes pale and pinched, the pulse feeble and small, and the temperature subnormal. Vomiting may have occurred, but as likely not. On

* *Brit. Med. Journ.* 1894, vol. i. p. 455.

inspection of the abdomen at an early stage the parietes are usually found rigid and very sensitive to palpation, the tenderest part is most frequently the epigastrium. The area of liver dulness may be absent from the escape of gas into the general peritoneal cavity, but the symptom is a very inconstant one and not reliable. In the course of a few hours the symptoms change, being those now of commencing general peritonitis, with possibly distension of the abdomen, vomiting and hiccough, rise of temperature, and some apparent abeyance of the patient's sufferings.

In consideration of the difficulties therefore which exist both in respect of diagnosis and treatment, it will be well to discuss somewhat in detail various points in connection with both these aspects of the question.

These cases may be said to class themselves under two heads. First there are those where the symptoms though acute are not markedly so, and where perforation is known to have occurred on an empty stomach; and, secondly, those where the symptoms from the commencement are excessively acute, and where perforation has taken place during or shortly after a meal. In the latter class, the only chance of life rests in operation, and that performed at the earliest possible period of the attack. In the former there would seem to be some reason for delay, since recoveries without surgical interference have been known to occur. It is fully questionable, however, whether we should admit of this possibility of nature's efforts. The risks of laparotomy are small compared with those connected with a gastric perforation of whatever kind, while the certainty of what can safely be done far more than compensates for the doubts that must otherwise remain.

There are two other conditions besides those which have direct reference to the state of the stomach at the time of perforation which have some bearing of interest; these are the position of the patient at the time of the accident, and a history of previous attacks of pain. In the former instance a patient at active work in the erect attitude is more likely to have a large extravasation of the contents of the stomach into the peritoneal cavity than one who is seized at night in the recumbent position. In the latter instance a history of periodical attacks of pain will probably indicate attacks of local peritonitis, and as a consequence the

existence of adhesions. In such cases the perforation may not prove of the same magnitude as where no adhesion exists.

The purely operative aspects of the question concern first the most suitable place to open the abdomen, and second, the treatment of the gastric lesion.

To expose the stomach the best incision, I believe, is one carried downwards from just below the xiphoid cartilage for about three or four inches. Some surgeons prefer an incision carried vertically downwards slightly to the left of the median line; while others again advocate an oblique incision running below the costal margin. My reason, however, for the median one is that not only may it quite suffice for all that is required in the treatment of the ulcer and the general peritoneal cavity; but that on closure of the wound it leaves the best kind of abdominal cicatrix for the prevention of any hernical tendency. In a case of perforated gastric ulcer operated upon in May 1899, the ulcer was seated about the middle of the lesser curvature. I was able to deal with it perfectly through the median incision, and although there was evidence of peritonitis as low down as the pelvic fossa, I could most efficiently cleanse the whole abdominal cavity. The wound healed by first intention and left a most firm and unresistent cicatrix.

Assuming that the stomach is exposed by the upper incision, a careful search is made for the seat of perforation. This may be detected either by the existence of adhesions binding down the floor of the ulcer to neighbouring parts or by the thickening in the wall of the stomach immediately around the ulcer and seat of perforation. The locality of the lesion once determined, an endeavour should be made to bring the affected portion of the stomach up to the abdominal incision. As likely as not this will be found impossible either from the position of the ulcer or from the adhesions which it has contracted to other parts. If freer access to the part appears desirable, and this can be attained by a transverse incision, the rectus should be divided, the branches of the internal mammary being secured as they are severed. Before proceeding further to deal with the perforation an endeavour may be made to ascertain the condition of the stomach with regard to its contents. If perforation has taken place during or shortly

after a heavy meal, it will be wise to relieve the stomach of its load. This may be done either through the perforation itself, or through the œsophagus by means of a tube. The selection of the method will depend upon the extent to which the perforation itself can be manipulated. Any further extravasation into the peritoneal cavity should be carefully avoided. I am disposed to think that time should not be wasted in any prolonged endeavour to empty the stomach of its contents, more especially so, if it is possible to obtain a perfectly secure closure of the perforation.

In dealing with the perforation four alternatives are open for adoption according to circumstances: (1) *Excision of the ulcer, including the seat of perforation, and union of the edges of the wound in the usual way;* (2) *simple suture of the perforation by Lembert's method;* (3) *union of the perforated gastric area with the parietal wound;* (4) *open drainage.*

(1) **Excision of the perforated ulcer.**—While this is the most radical procedure, and theoretically the most suggestive, it is frequently the least practicable. If not the position of the ulcer, its size and amount of surrounding induration may render it quite inadvisable to attempt so large an excision of a part of the stomach. Where, however, excision does seem feasible, there can be little doubt that it is ideally the best treatment. After the ulcer has been removed, any bleeding points should be secured and then the edges of the mucous membrane united by a continuous suture. Lastly, the edges of the sero-muscular coat are inverted, and the wound closed by a series of interrupted 'Lemberts.'

(2) **Simple suture of the perforation.**—This method, which has strongly in its support the fact that it has several times been successfully accomplished, consists in closing the opening by suture; that is to say, the stomach is picked up in a fold on each side of the ulcer and united over it by a few Lembert sutures—the ulcer, as it were, being tucked in. It adds additional security to attempt first of all to close the actual orifice itself by a few stitches, although some of these may seem ineffective, before doubling in the ulcer, and uniting the healthy tunics over it.

(3) **Stitching the seat of perforation to the abdominal incision.**—This method entails the temporary forma-

tion of a gastric fistula. The position of the ulcer must necessarily be on the anterior surface, and the conditions best suited for the treatment a large perforation, with an extensive area of induration. It should be remembered, however, that much may be done by utilising a portion of the omentum to close the opening. Thus the omentum is raised and turned up over the anterior surface of the stomach. The part which covers the aperture is then sutured round in such a way as to bring a tolerably broad surface of the membrane in contact with the healthy serous coat of the stomach at the circumference of the perforation.

(4) **Open drainage.**—It is quite possible that the surgeon may find that he is unable to carry out any one of the methods above described. In such a case his only resort is to free drainage. A tube must be passed down to the perforation and secured there while the parts around are carefully stuffed with strips of iodoform gauze, brought out, like the tube, through the abdominal wound.

Treatment of peritoneal cavity.—The last part of the operation, after the perforation has been dealt with, concerns the efficient cleansing of the peritoneal cavity. If on opening the abdomen at the earlier stage particles of fat or food are seen to escape from the upper incision, it may almost certainly be concluded that some of this same material will have found its way down into the most dependent parts of the abdominal cavity; and to ensure its complete removal from the pelvis, an extension downwards of the first incision may be necessary. For further particulars regarding the course now to be pursued, see chap. xxxviii., where the subject of peritonitis in its various forms is fully discussed.

The after treatment in these cases is of some moment. The stomach requires to be given as much rest as possible; and although in some of the successful cases something has been administered by the mouth within twenty-four hours of the operation, it is safer that nourishment should for the first few days be administered by nutrient enemata, and nothing more than a little ice given by the mouth if so required. These patients fortunately are not so reduced that they cannot stand a comparatively prolonged period of abstinence from food by the mouth. No haste therefore should be exercised in returning to the natural method of

nutrition, so long as the patient's strength appears well maintained.

4. **Formation of purulent collection and other septic changes.**—As a sequel to gastric ulcer, the formation of an abscess is by no means an infrequent occurrence. In some instances the septic mischief which arises does not take the form of an abscess. Thus pericarditis, pleurisy, empyema, and pneumonia are occasionally met with. Whatever may be the septic nature of the more distant complications, they are usually found to be secondary to some primary formation of pus in the immediate neighbourhood of the ulcer. It would seem to be rare for any septic absorption to take place from the ulcer itself, independent of the first production of inflammatory adhesions and other mischief at the floor of the ulcer. The intrathoracic complications are almost always due to the pre-existence of a so-called subdiaphragmatic abscess. Out of twenty-eight cases of this latter complication collected by Dickinson,* eighteen manifested some form of intrathoracic trouble.

The interest of these cases to the surgeon centres in the situation and extent of the purulent collection. While it is far from being always possible to state that a certain intra-abdominal abscess situated in the upper half of the abdomen owes its origin to a gastric ulcer, a very safe assumption may be made that such is the cause when a previous history exists of symptoms indicative of ulceration. The abscess when aspirated or opened, is frequently found to have fœtid and gaseous contents.

Suppuration commences as a rule in direct connection with the ulcer. Hence it often happens that when the ulcer is situated on the posterior aspect of the stomach, a considerable collection of pus takes place before there is any external manifestation of it. Again, it somtimes happens that the fulness which eventually manifests itself in the abdominal parietes does not present the dull sound indicative of a collection of fluid, but a tympanitic note due to the gas which the cavity contains. In some instances the pus does not collect to any extent in the immediate neighbourhood of the ulcer, but burrows to a distant part and then creates for itself a cavity.

In those cases where there is pylephlebitis with multiple

* *Brit. Med. Journ.* 1894, vol. i. p. 234.

abscesses in the liver and elsewhere, and specially such as have purulent collections in distant parts, like the parotid, the condition must be considered pyæmic in character.

One of the most interesting forms of abscess dependent upon gastric ulcer is the so-called subphrenic or subdiaphragmatic. Dickinson, following the nomenclature of Leyden, uses the term subphrenic pyo-pneumothorax, on account of the collection of pus and gas not being strictly of the nature of an abscess, but a collection of fluid bounded by the peritoneal walls. The foul gas and pus which constitute the contents of these collections may be found anywhere beneath the diaphragm and between it and the liver. The more usual locality is the left hypochondriac region. When the cavity or collection of fluid and gas has reached a sufficient size, a fulness presents itself in the epigastrium, and on percussion a tympanitic note may be heard over the swelling and extending either to the right or the left.

The constitutional symptoms which may become manifest as the result of a localised collection of pus vary considerably. In some cases the onset of the symptoms is acute, while in others there is but little disturbance of the patient's general condition throughout the course of abscess formation. Localised pain, however, with feverishness occurring in cases known to have previously exhibited unmistakable symptoms of gastric ulcer should always awaken a suspicion of some active septic mischief taking place. The symptoms associated with abscess formation sometimes mislead by resembling more strongly symptoms usually associated with inflammation elsewhere. Thus, in one recorded instance the symptoms were those of pericarditis, and in another those of pneumothorax.

The treatment of these cases consists in giving a free exit to the pus wherever located. A free incision may always be made when the collection of pus has increased to the extent of causing a prominence on some part of the abdominal surface. Adhesions will have been contracted between the abscess cavity and the abdominal parieties, so that, provided the incision is kept within a reasonable length, the danger of opening the general peritoneal cavity is remote. A large-sized drainage tube should be inserted and retained, and the abscess cavity freely irrigated with some antiseptic.

Provided there are no other complications of any gravity,

the result of opening and draining these fœtid collections of pus is usually good. The cavity gradually contracts and finally becomes obliterated.

5. **Formation of fistulæ.**—Two kinds of fistulæ result from the perforation of a gastric ulcer. First there are those which pass between the stomach and the bowel, and secondly those between the stomach and the cutaneous surface.

The usual method by which a connection is established between the cavity of the stomach and that of the intestine is that adhesions are contracted between the floor of the ulcer and the wall of the bowel. The process of ulceration continuing, perforation takes place, and a fistula is formed between the two. A more indirect method is for an abscess to form first in connection with the perforated ulcer, and then for this to burst into the bowel. In whichever way the communication is established, the result is the same; an intercommunication takes place between the contents of the two viscera—the gastric material passing into the bowel, and occasionally *vice versâ*. From the more constant and fixed relation of the colon to the stomach, a fistulous communication is more frequent between these two than between the stomach and the small intestine.

The symptoms of fistula bimucosa are dependent upon the escape of the fæces into the stomach and the gastric contents into the bowel. In the former case the patient will probably vomit material which will suggest the region of the intestinal tract from which it has escaped: the lower down the communication, the more will the ejecta resemble the character and consistency of true fæcal matter. In the latter, the premature escape of the imperfectly digested stomach contents into the bowel may give rise to gradual emaciation; and this will be more marked and rapid the lower the region of the gut opened into.

In cases of indirect communication, the sudden bursting of an abscess into the bowel will be followed by relief of such symptoms as had been associated with the process of suppuration; but sooner or later, evidences of the communication may become manifest.

Fistulæ between the stomach and the external surface of the body arise in similar ways to those between the stomach and the intestine—either there is a direct ulcerative connection or there is the intermediate formation of an abscess.

In addition there are fistulæ which are artificially produced; that is to say, they result from an endeavour on the part of the surgeon to secure to the abdominal incision an ulcer which has perforated.

As regards the treatment of the former class of cases, *i.e.*, where communication exists between the stomach and the bowels, an endeavour may be necessary to close it. What actually needs to be done can only be known after opening the abdomen and examining the affected region. Supposing it impossible to deal radically with the ulcer and with the intestine—that is to say, to excise the one and occlude the orifice of the other—it might be found possible to detach the intestine, refresh and suture the edges of the opening, and then to deal with the ulcer in one of the ways already described when excision is not feasible.

The treatment of a fistula which opens from the stomach on to the surface of the body by any operative procedure is—at least, at an early stage—questionable. In the first place, the fistula is of itself partly a curative measure. Complete cicatrisation of the ulcer and the stomach would be followed in all probability by a natural closure of the fistula; but so long as there is any active process of destruction going on, the fistula is for the time being a guard against more serious troubles. The earlier treatment must consist in endeavours to protect the skin from irritation around the external orifice. When for various reasons it may become necessary to operate, the abdomen will have to be opened, and a careful dissection executed to free the stomach and close the aperture—a procedure which may prove exceptionally difficult.

6. **External adhesions.**—Sufficient has already been said of the way in which adhesions are contracted between the floor of the ulcer and some neighbouring part. The process is in most instances a protective one. Except for the adhesion of the stomach to some other part, perforation into the general peritoneal cavity would be a much more frequent occurrence than it is. The way in which these adhesions give rise to trouble seems to be either by unduly fixing the stomach so as to impair its proper motile function, or by kinking the pyloric end, to cause obstruction. The result as regards the patient's symptoms is the production of obscure abdominal pain accompanied with invalidism or

debility, with no relief by any form of purely medical treatment.

That operation in certain cases is capable of giving complete and permanent relief is sufficiently well shown by the case I have already narrated,* and by many others which have been recorded where separation of the adhesions binding the stomach to the liver, gall bladder, or other parts has result in perfect recovery.

It should be remarked that when adhesions are separated by operation, an endeavour must be made to prevent a reunion of the disconnected parts. In the case of the pylorus this may be possible, but elsewhere it may be difficult.

7. **Internal contraction.**—The cicatrisation of an ulcer may lead to considerable alteration in the shape of the cavity of the stomach. The more serious contractions are those in connection with the pylorus, which will be dealt with immediately; but when the body of the viscus is implicated, bands may be formed, or the cavity become narrowed. Some of the instances of so-called "hour-glass" contractions are undoubtedly the result of cicatrisation from ulceration.

8. **Pyloric stenosis.**—Considerable obstruction at the pylorus may be caused by an ulcer situated at or in the immediate vicinity of the pyloric orifice. This obstruction may be brought about in one of three ways: either it may result from the amount of inflammatory thickening which usually takes place around the ulcer, or from cicatricial contraction consequent upon the healing of the lesion, or from spasmodic closure. In the last instance, it is supposed that reflex contraction of the pylorus takes place as the result of irritation of the floor of the ulcer.

The symptoms which arise in connection with obstruction at the pylorus from gastric ulcer being more or less common to those which manifest themselves from other sources of obstruction, they will be dealt with under the general heading of that subject.

In like manner the subject of treatment will receive consideration under the same heading. It may be briefly indicated here that stenosis from gastric ulcer has been successfully treated by pylorectomy, digital dilatation, pyloroplasty, and gastro-enterostomy.

* See page 128.

CHAPTER XVIII.

TUMOURS IN THE BODY OF THE STOMACH. INNOCENT; MALIGNANT.

THE tumours intended to be discussed here are such as involve purely the body of the stomach, having their seat in any part of the viscus between the two orifices. The large majority of tumours implicating the body of the stomach are carcinomatous; a few instances are recorded of sarcoma; and only exceptionally are tumours of an innocent character met with.

Innocent tumours.—As examples of innocent tumours, which may or may not give rise to symptoms, may be mentioned lipomata, lipo-myomata, fibromata, myomata, fibro-myomata, and lymphadenoids.

Pathologists are acquainted with other forms of innocent growths, such as multiple adenomata, fibrous papillomata, pouches, and cysts, but these give rise to little or no distinctive symptoms, and are mostly discovered only after death.

Certain cases of solid tumours are occasionally met with which present the clinical features of malignancy, and yet spontaneously disappear. They are frequently described as solid tumours of the abdomen, without any special indication of the part or parts with which they may be connected, or from which they may arise. In some instances, however, the association of the tumour with some distinct region has been noted, and in these it has more frequently been with the intestines, but instances where both the pylorus and the body of the stomach have each been involved, have been recorded. The probable inflammatory nature of these tumours will be further discussed when treating of the same disease in the intestines.

Malignant tumours. — Carcinoma.—Carcinoma is met with in the body of the stomach in three forms: (1) cylinder-celled, (2) spheroidal-celled, and (3) colloid. The third form, however, merely represents a degenerative

change in either of the preceding, but is more frequently found attacking the spheroidal-celled. The scirrhous and medullary varieties of carcinoma comprise both the spheroidal-celled and the cylinder-celled, inasmuch as fibrous tissue may enter very largely or very slightly into the structure of either of these forms. The tendency of all forms is to infiltrate and invade considerable areas of the stomach wall; the more circumscribed growths are usually the cylinder-celled. The true distinctions between the different forms of carcinoma are mostly determined by the microscope, but occasionally it is possible to distinguish them with the naked eye. Thus the colloid presents a somewhat gelatinous appearance, and the medullary tumour tends to invade the coats of the stomach and form projections externally. The parts of the stomach most frequently attacked are the lesser curvature and the anterior wall, in the order given.

Diagnosis.—It is not intended to discuss at any length here the symptoms of gastric carcinoma. It is never, unfortunately, at the early stage that the surgeon meets with these cases; it is usually not until a tumour can be felt, and the question is raised as to its possible connections and likely nature. It may be incidentally remarked that the early symptoms of gastric carcinoma appear frequently to be so obscure that the physician seems at present unable to diagnose the disease, or rather to distinguish between it and other affections, more especially chronic gastritis. It sometimes happens that there is an entire absence of any gastric trouble, though there is extensive disease in the organ itself. A man was recently under my care in the infirmary suffering from chronic cystitis, for which he was being treated. He was suddenly taken with severe abdominal symptoms and died in a few hours. At the post-mortem, extensive carcinoma of the stomach was found, with at one spot an ulcerative perforation. During his residence in hospital he had never shown any symptoms of his gastric complaint. Numerous somewhat similar cases have been recorded, where the most extreme disease has been found after death, yet during life, or up to a comparatively short time before death, there has been an entire absence of any indication of the stomach mischief. There is one symptom of considerable importance to which attention has been

forcibly drawn in recent years. It is found that with comparatively few exceptions hydrochloric acid is absent from the gastric juice in carcinoma of the stomach. (For description of method of examination see page 109.)

In some instances, though rarely, the supraclavicular lymphatic glands are found enlarged, those of the left side being the more affected.

The features regarding a tumour of the body of the stomach, when it can be felt, will be, in the first place, its situation. It will be located more or less in the epigastric region, extending, according to its dimensions or according to the extent of the stomach involved, to either side or below this region. It will sometimes be found to ascend and descend in respiration, and to alter its position according to the degree of distension of the stomach. It may be hard and painless to the touch, and capable of a certain amount of movement by manipulation. These few points present no degree of certainty in themselves, but existing in conjunction with others will materially assist towards a correct diagnosis.

The course which the disease may take varies. In most instances death sooner or later ensues from the emaciation and exhaustion due to an increasingly disordered digestion. In other cases some serious complication may hasten the end. Where ulceration is in process, a severe and fatal hæmorrhage may occur; or it may lead to perforation. As in the case of the simple form of ulcer, abscess may form at the seat of disease, as the bursting may result in fistulous connection either with the bowel or the calcareous surface.

Treatment.—After the surgeon has opened the abdomen and ascertained the nature of the tumour and its connections, he may find that any attempt at removal is impossible. One of the most marked features of carcinoma of the body of the stomach is its tendency to extensive invasion of the walls. The fact of being able to feel the growth through the abdominal parietes almost necessarily implies that the walls of the viscus have already become so extensively infiltrated that total removal will be impossible. Could such localised lesions as are shown in Fig. 14 be diagnosed, removal would be easy and a cure possible. It must be remembered, however, that the whole stomach has been successfully removed for extensive disease.

It is to be ardently hoped that when the physician and the practitioner come to recognise the value and harmlessness of exploratory operations upon the stomach, we may get many of these cases at an early period, before they have reached the stage of extensive involvement of the gastric parietes. Supposing there be some doubt as to whether



FIG. 14.—CARCINOMA OF STOMACH.—The ulcer is situated in the lesser curvature about two inches from the pylorus. (*R.I.M. Glas.*)

a case be one of simple chronic gastritis, no possible harm will accrue from an exploratory operation; both patient and practitioner will have the additional satisfaction of knowing the true nature of the complaint.

As regards removal of extensive disease of the organ, we are now in a position to record successful cases of total extirpation. But as yet they are few, some three or four, which constitute therefore little more than surgical curiosities. It is doubtful whether such an operation will ever come into anything like general or extensive practice. From my own investigations on the Cadaver, I know that it is impossible in every case after excising the stomach to get the

duodenum up to unite with the lower end of the œsophagus; failing the duodenum, however, a coil of jejunum can be easily approximated and attached.

The only palliative measure—if an operation may be so designated—is the performance of duodenostomy or jejunostomy, whereby the patient may be fed by the bowel, and so any troublesome symptoms dependent upon gastric ingestion relieved.

Sarcoma.—As compared with carcinoma, this is a rare disease of the body of the stomach. In an examination of fifty specimens of malignant diseases of the stomach by Perry and Shaw,* only four were found in which the tumour was a sarcoma, and in each of these the pyloric region was principally affected, the disease spreading towards the body of the organ.

As regards diagnosis and treatment, there is but little to add to what has already been said in connection with carcinoma of the organ. From the fact of sarcomata being more localised in their involvement of the gastric walls, removal by excision may be considered.

CHAPTER XIX.

OBSTRUCTION AT THE CARDIAC AND PYLORIC ORIFICES.

Cardiac obstruction.—Obstruction at the cardiac orifice by carcinoma may arise from extension downwards of disease in the œsophagus, or be primarily connected with the stomach. When the tumour is œsophageal in origin, it is usually of the squamous-celled variety; while when it is gastric, it is generally spheroidal-celled. The symptoms connected with the involvement of this orifice have already been sufficiently discussed in treating the subject of stenosis of the œsophagus; it only remains to add that when the obstruction is due purely to gastric disease, the earlier

* *Guy's Hospital Reports*, 1891, 3rd series, vol. xxxiii. p. 137.

symptoms are often associated with some disturbance of the stomach.

As regards treatment, something operative may be done to alleviate the patient's sufferings. Thus if the body of the stomach be not too much involved, gastrostomy may be performed. Should this, however, not be possible, either duodenostomy or jejunostomy will be needed. The latter operation I have performed by Maydl's method, with much relief to the patient. Whether resection of the cardiac orifice will ever come within the field of practical surgery, time alone can prove. Suffice it to say that such an operation has been recently devised. Curetting the orifice through an opening in the stomach has, however, been performed with relief.

Pyloric obstruction.—Carcinoma of the pylorus far outnumbers malignant affections either of the body or of the cardiac orifice of the stomach. I propose, however, to deal not only with carcinoma, but with any condition which obstructs the pyloric orifice.

Causes of pyloric obstruction.—The various causes which give rise to obstruction may be primarily divided into those which act from without and are independent of the pylorus, and those which arise directly in connection with it or the stomach.

Obstruction from without.—Any tumour arising from the pancreas, liver, gall bladder, omentum, mesenteric or retro-peritoneal glands may press upon and obstruct the orifice. Similarly aneurysm of the aorta or cœliac axis, and hydatid cysts. Cicatricial bands arising from previous inflammatory mischief in the neighbourhood of the pylorus may cause constriction.

Obstruction from conditions directly connected with the pylorus.—By far the larger number of cases of obstruction owe their origin to some cause organically connected with the pylorus. The commonest cause is carcinoma, which obstructs either by the thickening it produces in the walls of the orifice, or by warty, villous, or nodular projections into its canal. With rare exceptions the disease never passes beyond the pylorus into the duodenum; on the other hand, the fundus of the stomach may be extensively invaded. The form of carcinoma is either the spheroidal-celled or the cylinder-celled. The former sometimes assumes the typi-

cally scirrhous character. It is now generally believed that many cases, which were at one time supposed to be non-malignant fibrous thickening of the pylorus, are forms of scirrhous carcinoma. Microscopically little else than fibrous tissue is found; but when enlarged lymphatic glands are examined, the presence of epithelial cells demonstrates the true nature of the induration. Cases of sarcoma of the pylorus are much more rarely met with. As already indicated, obstruction may be caused by a simple gastric ulcer. Inflammatory thickening around a progressive ulceration may cause considerable narrowing of the canal, and the same result may take place from the cicatrisation of the ulcer in the process of healing. Instances of obstruction due to a state of chronic reflex spasmodic contraction of the part have been recorded, where the primary seat of irritation was a large ulcer. A true fibrous stricture may result from irritant poisoning.

Among exceptional causes of obstruction may be instanced a large myoma, and thickening due to the irritation of a gall stone, which ulcerated from an adherent gall bladder through the pylorus into the stomach. Lastly, there are cases of congenital stenosis.

Symptoms.—Obstruction at the pylorus, from whatever cause, manifests itself insidiously. The earlier symptoms are those connected with some gastric disturbance. The contents of the stomach being unable to obtain a free exit through the pylorus, are thrown back again upon the gastric cavity, with the result that the mucous membrane soon suffers and normal digestion no longer takes place. This disorganisation of the proper function of the stomach soon manifests itself in various dyspeptic symptoms. The patient complains of discomfort in taking food, a feeling of fulness or weight in the region of the epigastrium, a sense of nausea, with furred tongue and foul breath. Want of appetite and a tendency to refrain from food is seen in those cases where much pain is associated with ingestion. In other instances there is a craving for food, and the stomach is so tolerant of its presence that large quantities accumulate before being ejected. Tenderness may be experienced when pressure is made over the stomach. Headache, depression, and other neurotic symptoms may be present.

As the obstruction becomes more marked, the various

symptoms become exaggerated, and constant vomiting, either immediately after food or at variable periods later, soon becomes a prominent feature. Coincident with these symptoms is a gradual falling off in body weight and strength. Constipation causes much annoyance and discomfort. When that stage is reached in which the stomach begins to lose the power of returning its contents, vomiting becomes less frequent, fermentation of the retained food grows more active, and the viscus may get so distended with gas that it presses upon the heart and lungs, and the patient becomes distressed both by palpitation and dyspnœa.

Diagnosis.—It is not usually until vomiting has become a frequent and prominent symptom, that pyloric stenosis is one of the causes thought of. The early dyspeptic symptoms, while sufficiently marked of themselves, are too suggestive of so many other causes to be of any specially diagnostic value. By the time vomiting has proved itself an intractable and constant symptom, two other conditions may have sufficiently developed to aid materially in arriving at a correct diagnosis. The first of these is the existence of a tumour in the epigastric or right hypochondriac region; and the second, dilatation of the stomach.

There is nothing markedly characteristic in the tumour. Its size and mobility depend upon its nature and the amount of fixation. In cases of a long gastro-hepatic omentum, or of a comparatively firm solid tumour, it may be freely moved in all directions; and in cases of very thin abdominal walls, it can be almost grasped with the finger and raised. Where the opposite conditions exist, the tumour may be so bound down and confined beneath the liver that it cannot be palpated. Material assistance will be obtained in determining these various features of the tumour by the administration of an anæsthetic. Supposing a tumour can be felt, it will in the majority of instances indicate either the thickening due to a gastric ulcer or to malignant disease, and there is nothing in the nature of the tumour so felt that will help to distinguish the one from the other.

As already indicated in discussing the subject of carcinoma of the body of the stomach, much importance has been attached, from a diagnostic point of view, to the existence or non-existence of free hydrochloric acid in the gastric



FIG. 15.—CARCINOMA OF PYLORUS.—The lesser curvature has been encroached upon and drawn in; the body of the stomach is much dilated. (*W.I.M. Glas.*)

contents as a means of distinguishing cases of ulcer from those of malignant disease. In the former the acid is present and often in excess, while in the latter it is most commonly absent. In all cases therefore a careful examination of the contents of the stomach should be made. (See page 109.)

The dilatation of the stomach which follows upon any form of obstruction at the pylorus is important in so far as it helps to support the correctness of the diagnosis. There is, however, considerable difficulty in determining such dilatation in all except the most marked instances. In the first place there is considerable variation in the normal size and capacity of the stomach, and in the second the methods at our disposal are far from giving any very certain results. An endeavour, however, must be made to ascertain, if possible, the amount of dilatation present; for not only is it important from a diagnostic point of view, but it is some advantage to the surgeon to know, in view of any operation, whether or not he has a dilated viscus to deal with.

To avoid repetition here, the reader is referred to the section on physical examination of the stomach, where the methods of inspection, palpation, auscultation, and inflation necessary to be employed in these cases are fully described. (See page 112.)

It may, however, be briefly pointed out that where a patient is known to retain his food for twenty-four hours or longer, and then bring up some very large quantity—a "basinful" as it is sometimes expressed—there can be very little doubt of the dilated condition of the stomach. Further, the extreme emaciation which so often exists, and the sunken state of the abdominal parietes, admit of a visible projection of tbe stomach as it is slowly distended with air pumped into it. The quantity which can thus be introduced, and the level down to which the greater curvature extends below the umbilicus, will assist in conveying some notion of the amount of dilatation present. In some cases a marked peristaltic action of the stomach walls is seen. The stomach appears and disappears like a phantom tumour. These movements may be taken as pathognomonic of obstruction at the pylorus.

Succussion when present two or three hours after a meal usually indicates some amount of dilatation.

The diagnosis of the rarer causes of pyloric obstruction can in most instances only be conjectural. With the exception of such forms of stenosis as can be traced to the imbibition at some antecedent date of a corrosive or irritant poison, it is not possible prior to an operation to ascertain the true nature of the obstruction.

Treatment.—It is impossible by any other measures than those which are purely surgical to deal with organic obstruction at the pylorus. It is true that much may be done by such palliative measures as washing out the stomach and careful attention to diet, but these only alleviate for a time. Sooner or later the patient must sink from inanition. If surgical interference is to be entertained, the question of most moment is, how long are these palliative measures to be continued before some radical attempt is made to overcome the obstruction? The custom of the past has been to delay anything operative until the patient is practically *in extremis*. The practice of the future will be to operate as soon as there is reason to believe obstruction, even though slight, is present. The results of such early operations will be, first, to subject the patient to an operation from which he will have a much greater chance of immediate recovery; secondly, to prolong life beyond what it would otherwise have reached; and lastly, to give a chance of a permanent recovery. No statistics based on past experience can convey any adequate impression of what may be hoped for in the future. Every surgeon's retrospect is more or less a gloomy one. He mostly recalls cases where the patient seemed already to have one leg in the grave, and his operation consisted only too frequently in helping in the other. But no such gloomy prospect need exist for the future, if only these cases are taken early enough: when the patient has a sufficient store of strength to draw upon, and his recuperative powers are not just on the verge of extinction.

The kind of operation to be performed depends upon the nature of the obstruction. In cases of a cicatricial stenosis such as result from traumatism, corrosive poisoning, and ulceration, the pylorus may be excised, digitally dilated as by Loreta's method, divided longitudinally and stitched transversely as by pyloroplasty, or simply gastro-enterostomy performed. In cases of malignant tumour the operation

selected will depend upon the extent of the disease and its connections with adjacent parts. For a freely movable and moderately localised growth pylorectomy, or this operation in conjunction with gastro-enterostomy, may be performed. Where removal does not seem feasible, either from the extent of the disease in the stomach or from its involvement of neighbouring parts such as the omentum and pancreas, gastro-enterostomy, duodenostomy, or jejunostomy may be performed. Bernays, after completing gastrostomy, scraped away as much as possible of the obstructing tumour, and so established a free communication between the stomach and the duodenum.

For the details regarding the performance of these operations the reader is referred to the chapters at the end of each section on diseases of the stomach and of the intestines respectively; but there are certain general preparations to be made before, and details to be attended to after, operation, which may be properly considered here.

Before operation.—The stomach should be washed out with warm water. If dilatation be marked it is better to wash out for a few days previously. Under ordinary circumstances the day before and the morning of the operation will be sufficient. The washing ought to be efficiently done, and in my own experience nothing answers better, when it can be passed, than a fair-sized ordinary rubber tube with a large oval opening cut in it close to its terminal orifice. The other end is attached to a funnel or filler, which when raised slightly above the patient's head, allows the fluid to flow in slowly. To remove the fluid the filler is lowered below the level of the bed and the patient requested to voluntarily express. This can be repeated two or three times until the fluid returned is clear. The voluntary expression on the part of the patient tends to get rid of all the fluid better than any mechanical suction. In cases, however, of greatly dilated stomach, the voluntary effort on the part of the patient is not sufficient, and the pump must be used. When, from excessive sensitiveness of the pharynx and gullet, retching is readily evoked by the introduction of the tube, the soft rubber one will not answer, for the pressure requisite to get it down causes it to double up in the pharynx and interfere with respiration. In these cases, therefore, it is necessary to

use the ordinary stomach-pump tube, which possesses the requisite amount of rigidity.

The rectum should be well cleared of any fæces, in order to place it in the best condition for the reception of nutrient enemata. It is a wise course to administer a nutrient enema containing an ounce or two of brandy just prior to the operation.

The abdominal skin should be properly cleansed. The extreme emaciation which the patients have generally undergone makes them all the more susceptible to changes of temperature. Hence every precaution should be taken to maintain the warmth of the body. The arms, upper part of chest and legs, should be well covered with woollen garments. In the room where the operation is to be performed every consideration should be given to the warmth of the room itself, and of everything to be used at the operation. With the same object the operation should be performed as expeditiously as possible.

After operation.—The sum total of all after-treatment consists in giving the patient and the parts operated upon complete rest. In hospital these cases should be placed in a separate apartment, and nursed by a special nurse day and night. Quietness is conducive to sleep, and sleep to repair. In cases where pain is complained of, it is felt to a very variable extent. In cases that do well it is never very severe. Hypodermic injections of morphia ($\frac{1}{6}$ or $\frac{1}{4}$ grain) should be given, and repeated if required. Much inconvenience is often felt by the patient during the first night or two from being kept in the supine position. More good is gained by turning the patient slightly to one side, and maintaining the position for a time by propping with a pillow, than by preventing rest and repose by rigidly enforcing the dorsal position. The knees should be kept flexed, to relieve any tension on the abdominal parietes. Chloroform sickness is always an unwelcome and somewhat dangerous sequel to the operation, and unfortunately little or nothing can be done to stop it.

The question of nourishment is of the utmost moment. It may be said to increase in importance in proportion to the degree of emaciation which exists at the time of operation. For rapidity of healing, complete rest of the wounded parts is essential; and this applies more particularly to

operations which involve the accurate stitching of one viscus to another. When therefore the patient's strength will admit, all nourishment for the first forty-eight hours should be by nutrient enemata, and nothing should be administered by the mouth, except a little ice for the purpose of moistening the tongue and fauces. The longer this method of nutrition can be maintained the better. Where, however, it is seen that the patient's strength is likely to fail unless food be given by the stomach, it must be so administered. Food has been given without harm in cases of gastro-enterostomy almost immediately after operation. Many cases, however, have been recorded where, through strain from vomiting and other causes, stitches have given way. It is therefore much wiser, so long as the patient's strength seems sufficient, to enjoin perfect rest to the stomach by administering all nourishment *per rectum*. Food when first taken by mouth, whether early or late in the treatment, should be of a bland, nutritious, and easily digestible nature. Milk will form the staple diet, but to it may be added finely ground farinaceous materials. In like manner nitrogenous food, such as boiled fish and boiled fowl, should be administered in a finely divided or triturated state, and the latter mixed with the broth in which it is cooked. For suitable enemata, reference should be made to chap. lxi., where various kinds are given.

Prognosis in respect to the different operations.—So much depends upon the strength of the patient at the time of the operation, that statistics cannot be said to have much value. A patient who from excessive inanition dies shortly after the operation ought not to count as a fatal result due to the operation. Speaking in a general way, an operation is severe in proportion to the time it takes to perform it. Experience forcibly teaches the truth that a long operation is more fatal than a short one. An excision of the pylorus, which is usually a comparatively long operation, is a much more fatal one than gastro-enterostomy. An operation, however, which seeks to extirpate the disease ranks incomparably higher than one which only aims at alleviating for a time the patient's sufferings.

In discussing the relative merits of operations upon the stomach for affections of this region it must be remembered that any kind of operation performed for non-malignant

disease is more favourable both in its immediate effects and results than the same operation performed for cancer.

The effects which have to be considered in regard to operation are two—the immediate and the remote. If we take first of all the operations of pylorectomy and gastro-enterostomy, not regarding the different methods employed in the performance of each, we have the following results taken from the most recent statistics obtained from Czerny's Heidelberg Clinic. They embrace a period of seventeen years, from 1881 to 1898, and comprise—exclusive of gastrostomies—192 operations upon the stomach:—

Pylorectomy.—"Twenty-four pylorectomies for carcinoma and sarcoma, nine died as a direct sequel of the operation. In others life was prolonged in one for three months, in four for seven months, and one in each instance for periods of nine, ten, eleven, fifteen, twenty, and thirty-one months respectively. Four were living from periods after operation of nine months, eleven months, three and a half years, and seven years. The operation was also performed five times for non-malignant stricture; one case had remained well for fifteen years. This operation has more recently been abandoned for pyloroplasty or gastro-enterostomy. The average duration of life in the twenty-four operations for malignant disease was eleven months; excluding the cases dying as a direct result of operation, the prolongation of life averages twenty-two months. There is, however, a direct mortality of 37 per cent."

Gastro-enterostomy.—"The total number of gastro-enterostomies was 110 with thirty-three deaths or 30 per cent. mortality; eighty-two were for malignant diseases, with twenty-nine deaths or a death percentage of 34·5; there were twenty-eight cases of non-malignant disease with four deaths or a mortality of 21·4 per cent. The duration of life in cases of cancer average 12·6 months. The cases living were operated upon respectively $4\frac{1}{2}$, 5, and $5\frac{1}{2}$ years. Of the twenty-eight cases of non-malignant disease, twenty-three were still alive."

Pyloroplasty.—"The number of pyloroplasties performed was eleven with one death." Owing to the frequent return of symptoms in this operation Czerny has now practically abandoned it in favour of gastro-enterostomy. It may safely be affirmed that these statistics taken from

the work of one man, show results as favourable as any that may be expected, and certainly more favourable than is likely to be the case in less experienced hands. According to Czerny's own showing his rate of mortality in 1881 was 45 per cent., while in 1897 it had been reduced to 16 per cent. The value of experience is still more strikingly shown in the case of Professor Krönlein of Zurich, who, in some recently published statistics, recorded that in his first four pylorectomies three died, while in his last twenty only two have succumbed. It must be confessed, that as regards malignant disease, there is very little to show that removal of the pylorus is likely to result in a permanent cure. Both operations may unquestionably prolong life and relieve suffering. If more than this is to be looked for, it must be in operation at a much earlier period of the disease than is the practice at present.

CHAPTER XX

DILATATION. CONDITIONS DEPENDENT UPON EXTERNAL INFLUENCES SUCH AS ADHESIONS, TUMOURS, AND SYSTEMIC DISEASES.

Dilatation.—The condition of dilatation of the stomach or gastrectasia has already been dealt with in connection with stenosis of the pylorus. It is introduced here, however, for separate consideration because of its requiring, under certain circumstances, separate treatment.

It is only within the last few years that unobstructive dilatation of the stomach has received treatment at the hands of the surgeon. And I think there can be but little doubt, although I speak from the rather limited personal experience of only two cases that there is a sphere of labour in this direction that may prove of considerable value in the future. There are apparently classes of cases better known to the physician and the general practitioner, where the stomach has become chronically dilated either from chronic

catarrh or atony, and in which a train of obstinate and troublesome symptoms has arisen solely as the result of the dilatation. I mention specially these two causes because they are given by Clifford Allbutt in his "System of Medicine" as probably the commonest, but certain constitutional diseases may equally produce chronic dilatation. However produced, this condition would seem to be particularly obstinate and unamenable to treatment, except in so far that frequent lavage is attended with some temporary relief; in some cases the dilatation appears to have resulted in fatal gastric tetany. Dilatation of the stomach is not likely to come into the surgeon's hands, until the distension of the organ has reached an almost visible and tangible extent. For that reason, therefore, there is little need to enter into detail regarding the symptoms. The surgeon should, however, render himself familiar with one or two of those methods which will enable him to gauge to some extent the size or amount of dilatation of the organ he is called upon to treat. The methods of injecting water into the stomach or pumping air into it have both been fully described in the chapter on physical examination. The better of the two procedures is to inflate with air, as when the patient is lying in the dorsal position, the stomach is very plainly seen to rise beneath the abdominal parietes.

The treatment which the surgeon proposes to adopt is to lessen the size of the stomach, by folding in and securing a good portion of the anterior wall of the viscus, to the extent, in some instances, of approximating the two curvatures to each other. The operation itself—gastrorrhaphy—will be fully described later, but its results so far as they have as yet been ascertained may be alluded to here. My own two cases were very markedly benefited. Sufficient time has not yet elapsed to say whether it will prove permanent. They were not cases of very extreme dilatation, but in neither instance did there exist any obstruction at the pylorus, and in neither was it possible to say the precise cause of the dilatation. The first case has been published in the *Lancet*.* Many other cases have been reported since those by Bircher in 1890, which were in reality the pioneers of the class.

* 1899, vol. i. p. 952.

Conditions dependent upon external influences such as adhesions, tumours, and systemic diseases. —The stomach is liable to be affected by various conditions not immediately connected with its structure. These conditions may be purely mechanical, dependent upon some local pressure or displacement of the organ; or they may be more strictly functional, dependent upon some interference with the proper quantitative or qualitative supply of blood to the part or with its nerve supply. The result in either case is interference in some way with the normal digestive function.

Few of the systemic causes fall within the domain of the surgeon; it is only when the cause appears to be locally situated that surgical interference is called for.

Pressure exerted by tumours has already been alluded to in discussing the various causes of obstruction at the pylorus, it only remains to be said that the body of the stomach may similarly be impinged upon by tumours of a solid or cystic character arising from neighbouring organs or tissues. In many cases it will be impossible to determine, without an exploratory laparotomy, whether the tumour is intrinsic or extrinsic. Where the disease has its origin within the parietes of the stomach, the gastric symptoms are likely to be more marked than in the opposite condition. Little importance, however, can be given to this as a means of distinction, when it is remembered how gravely the body of the stomach may be involved in carcinoma and yet the gastric symptoms be almost *nil*.

In some cases, such for instance as aneurysm of the abdominal aorta, symptoms other than those connected with the stomach will assist in determining the true nature of the tumour.

There is a class of cases which has received some little attention within recent years where, as the result of inflammation, adhesions have formed between the stomach and neighbouring parts, giving rise to protracted and irremedial gastric symptoms.

Adhesions the result of gastric ulceration have already been referred to; but many cases are now recorded where the stomach has become attached to the liver, gall-bladder, and colon, as the result of inflammation connected with these parts. Indirectly also the stomach has been drawn upon by the omentum, which has itself contracted adhesions

to old tuberculous glands situated in the mesentery, to the sac of an old hernia, or to some of the female pelvic organs when inflamed at an antecedent period. In some instances the stomach becomes attached to the abdominal parietal wound after the operation of laparotomy.

The good effected by separating some of these adhesions, and so setting free the stomach, has been well illustrated by cases operated upon and recorded by Mayo Robson.

CHAPTER XXI.

OPERATIONS.

1. LAVAGE.
2. ASPIRATION.
3. GASTROTOMY.
4. GASTROSTOMY.
5. GASTRECTOMY.
6. GASTRORRHAPHY.
7. GASTROPEXY.
8. GASTRO-ENTEROSTOMY.
9. PYLORECTOMY.
10. PYLOROPLASTY.
11. PYLORIC DIVULSION.
12. PYLORIC CURETTING.

1. **Lavage.**—The process of washing out the stomach has already been fully described under the heading of Pyloric Stenosis (see page 157). It only remains here to refer to some of the dangers connected with the operation when employed for any disease of the stomach. Such accidents as syncope and sudden death occasionally happen, possibly the result of sudden alteration in the gastric pressure, which brings about a reflex condition of shock. To avoid such serious complications, care should be taken not to empty the stomach too rapidly or to introduce too large a quantity of fluid at one time. When for special reasons it is necessary to inject a considerable amount of fluid, both the inflow and outflow should be intermittent, so as to approach more nearly to the normal function and thereby allow the stomach to accommodate itself slowly to the artificially produced conditions. A case of hæmorrhage ollowed in one instance doubtless due to the too sudden

relief of tension in the walls of the stomach, consequent on a rather hasty removal of its contents.

In not a few instances symptoms of tetany have appeared within a short time after the removal of the tube. The cases have mostly been those in which the stomach was largely dilated.

Perforation and rupture have also followed lavage. The former has happened when the operation has been performed in cases of ulceration. The latter happened in a case of my own where, three days after performing gastro-enterostomy, an attempt was made to wash out the stomach. The insertion of the tube evoked a fit of vomiting, which caused the patient to feel a sudden and acute pain in the pit of the stomach. The sequence of events was the rapid formation of a gastric fistula, and death from inanition.

While thus enumerating some of the accidents which have resulted from such a simple process of treatment, it must not be concluded that the operation offers objections to its employment where it seems distinctly indicated. The frequency with which it is used by the physician without danger, and the unquestionable advantages attending its employment, are out of all proportion to the occasional occurrences of the above mishaps.

2. **Aspiration.**—Occasionally it happens that cases of carcinoma of the stomach present enormous distension of the viscus with gas. In these instances the heart's action may be seriously embarrassed, and death becomes imminent if relief is not given. It is in such exceptional instances that the use of Dieulafoy's aspirator may be of use.

3. **Gastrotomy.**—The operation consists in an incision into the stomach for the removal of a foreign body, for exploratory purposes, and for the immediate treatment of certain constricted conditions of the cardiac and pyloric orifices. The gastric wound is closed at the same operation.

Before operation.—The patient's bowels should be cleared out as well as possible by copious enemata. The skin over the upper part of the abdomen should be cleansed and prepared in the usual way; and, as in all abdominal operations, the limbs of the patient, and as much of the trunk as is possible, should be clothed in some woollen material. Every other precaution also should be taken to maintain the temperature of the body.

Operation.—(1) *Skin incision.*—The choice of the incision is determined either by the existence of some definite feature in the case, as the tangible projection of a foreign body, or by considerations of anatomy. In the former instance the incision is carried either obliquely or vertically over the spot where the body is most distinctly felt; in the latter, a vertical median incision may be made for some three inches or more downwards from the ensiform cartilage, or a curvilinear or oblique one from the median line outwards to the right for a similar extent, and about an inch below the costal cartilages. For exploration of the pylorus the median incision is the better; while for exploring the cardiac orifice the curvilinear is preferable. It should be remembered that in examining this latter orifice, the index finger must be directed towards the spine slightly to the left side of which the œsophagus passes through the diaphragm.

All bleeding vessels in the abdominal wound must be secured prior to opening the peritoneal cavity.

(2) *Stomach incision.*—In the case of a foreign body, the object is sought for in that situation where the body projects most prominently; this being more particularly the case where the body is sharp-pointed and possibly impacted. For purely exploratory purposes an endeavour is made to secure a point on the anterior surface about midway between the two orifices. It is, however, no easy matter to be certain of the particular area secured.

If it is practicable, the part of the stomach wall to be incised should be drawn up to and out of the parietal incision. In any case, sponges or cloths must be carefully packed around the part to be incised, with the object of preventing any escape of the gastric contents into the peritoneal cavity.

To prevent the possibility of the stomach slipping back into the peritoneal cavity before the operation is completed, it is advisable to secure it by a couple of stitches passed through its parietes on either side of the projected line of incision. These are left long so that they can be held by the assistant.

The incision in the stomach is made transversely to the long axis of the viscus, and midway between the two curvatures with the object of better avoiding the blood vessels. A

sharp-pointed curved bistoury may be used to complete the whole incision, or a puncture may be first made, and then the wound enlarged with scissors to the required extent.

All manipulations within the stomach must be carefully executed; more particularly does this apply to the extraction of long or sharp-pointed foreign bodies. In some instances it is advisable to alter the position of the body, so as to place it in a diameter which will admit of its easier passage through the wound.

To close the gastric wound the lax mucous membrane should be first stitched by a continuous suture, and then the serous coat doubled in by a series of Lembert stitches.

The wound is finally cleansed, the long "securing" stitches withdrawn, and the sponges or cloths—the number of which by way of precaution should have been previously noted—removed. The stomach is then put back into its position, and the abdominal wound closed in the usual way.

After operation.—The principle of the after treatment consists in rest to the patient generally, and to the stomach locally. The patient should be kept in a quiet room for three or four days, undisturbed by any other than those in direct attendance. Food should be administered *per rectum*, and only a little ice given by the mouth to relieve dryness of the tongue and fauces. On the third or fourth day, if all has gone well, fluid nourishment may be begun by the mouth.

4. **Gastrostomy.**—The operation consists in forming a fistulous connection between the stomach and the abdominal parietes, with the object of introducing food directly into the cavity of the former.

Preparation of the patient before operation.—The same preparations as advised for gastrotomy should be employed here. The patient, however, from the nature of the diseaee for which the operation is to be performed, being probably in a much more reduced state than in cases for gastrotomy, greater precautions should be taken regarding all points affecting the patient's strength. Expeditiousness in operating is of considerable moment. A nutrient enema containing an ounce or two of brandy should be administered just prior to the operation.

The Operation.—Various methods of performing the operation have been practised, and the chief reason for their differences in modes of procedure has been the effort

to avoid, after the completion of the operation, the escape of gastric juice and the contents of the stomach through the fistulous tract. I shall limit myself to the description of only two of these methods, merely briefly referring to the others. That which is now probably the most frequently practised is Frank's operation, or, as it is sometimes mistakenly called, Albert's. It was in reality first performed by Frank in Albert's Clinic.

Frank's Method (see Figs. 16 and 17).—The surgeon will operate most conveniently by standing on the patient's right side.

Skin incision.—The opening into the peritoneal cavity is made by carrying the incision for two or three inches parallel to the costal cartilages on the left side and at a distance of one inch from the margins of the same. The point of commencement of the incision above is determined by the extent to which the liver descends. It should not cover more than half an inch of its margin, otherwise that viscus is liable to press injuriously upon the upper connecting stitches of the stomach and the parietes. Kocher modifies this incision slightly thus: he divides the skin, superficial fascia, and anterior layer of the rectus sheath by a cut that passes downwards almost vertically. The fibres of the rectus muscle are then separated by a blunt instrument, and the deeper layer of the rectal sheath with the peritoneum, incised.

As soon as all bleeding points are secured and the peritoneal cavity opened, the surgeon introduces his index finger, in an upward and backward direction, to search for the stomach. Some difficulty may be encountered in finding it, from its contracted condition and situation behind and high up beneath the diaphragm. The colon is liable under such circumstances to present itself, and without proper care may be mistaken for the stomach and stitched to the wound. To avoid any such fault the finger should be passed up the under surface of the left lobe of the liver to the portal fissure, then downwards along the gastro-hepatic omentum to the lesser curvature of the stomach, and so on to its anterior surface. As a further means of distinguishing the stomach from the colon, it may be pointed out that the former is much thicker in its walls, and of a more decidedly pinkish hue.

The stomach wall is hooked up by the finger, and then, between it and the thumb, brought out at the wound. If

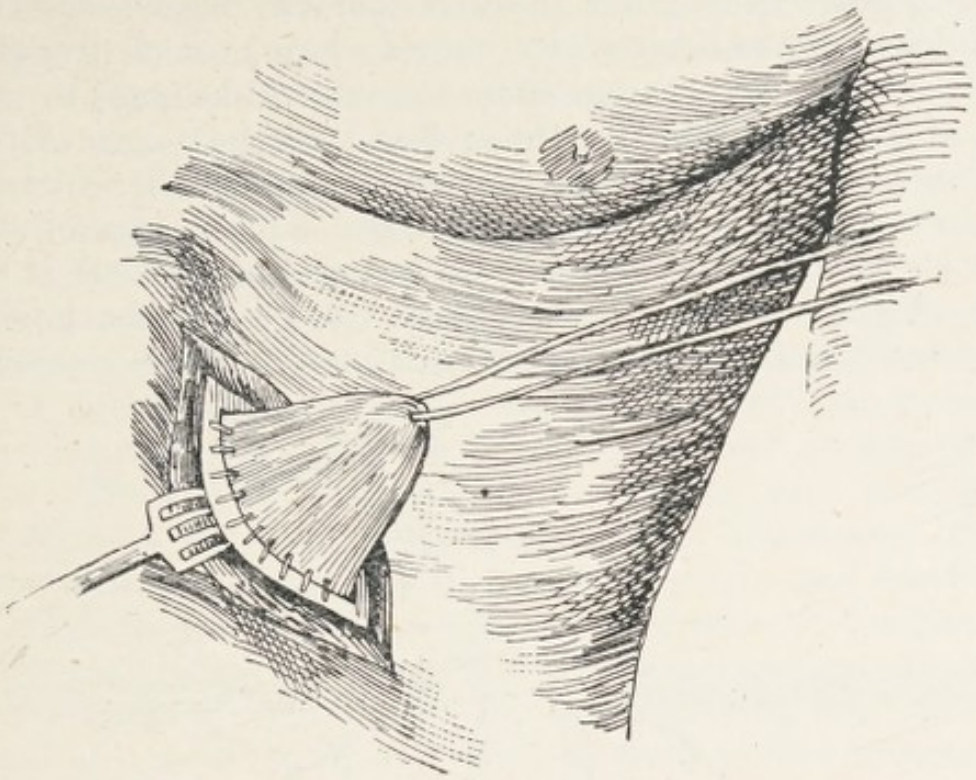


FIG. 16.

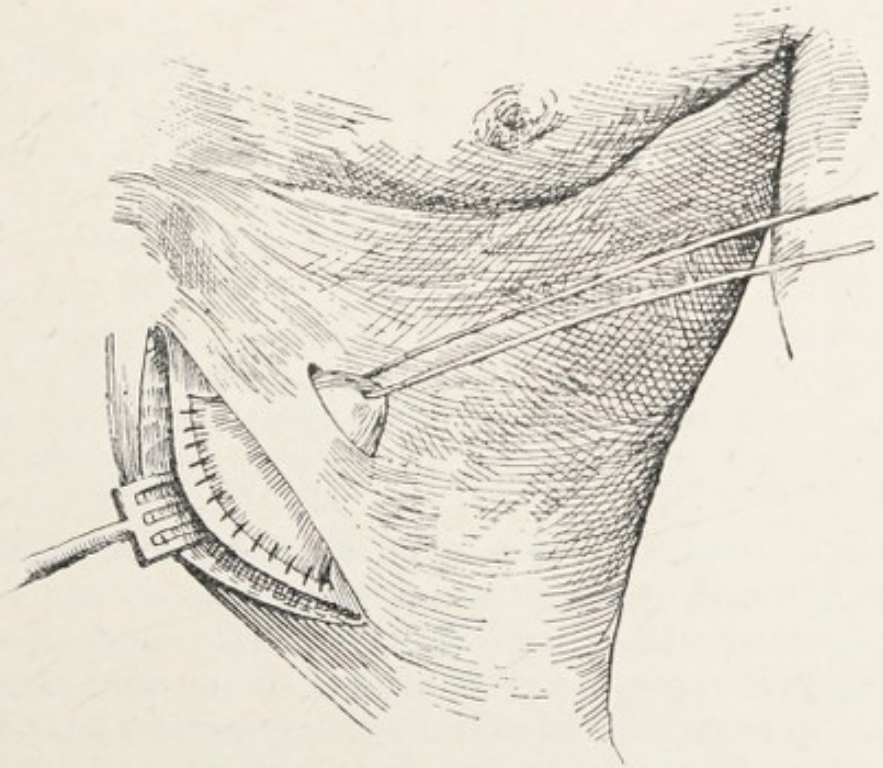


FIG. 17.

FIGS. 16 AND 17.—Diagrams showing Frank's Method of Subcutaneously Fixing the Stomach in Gastrostomy. (Meyer.)

there appears to be much traction upon the organ, a portion of the anterior wall must be obtained where no such dragging exists, and in every case an endeavour should be made to get a part of the stomach nearer the cardiac than the pyloric orifice.

Fixation of the stomach.—A second and smaller incision is now made over the costal cartilages. The bridge of skin between the two incisions is dissected up, and beneath it the cone of the stomach is passed and fixed to the margins of the second incision. An opening is made into the stomach

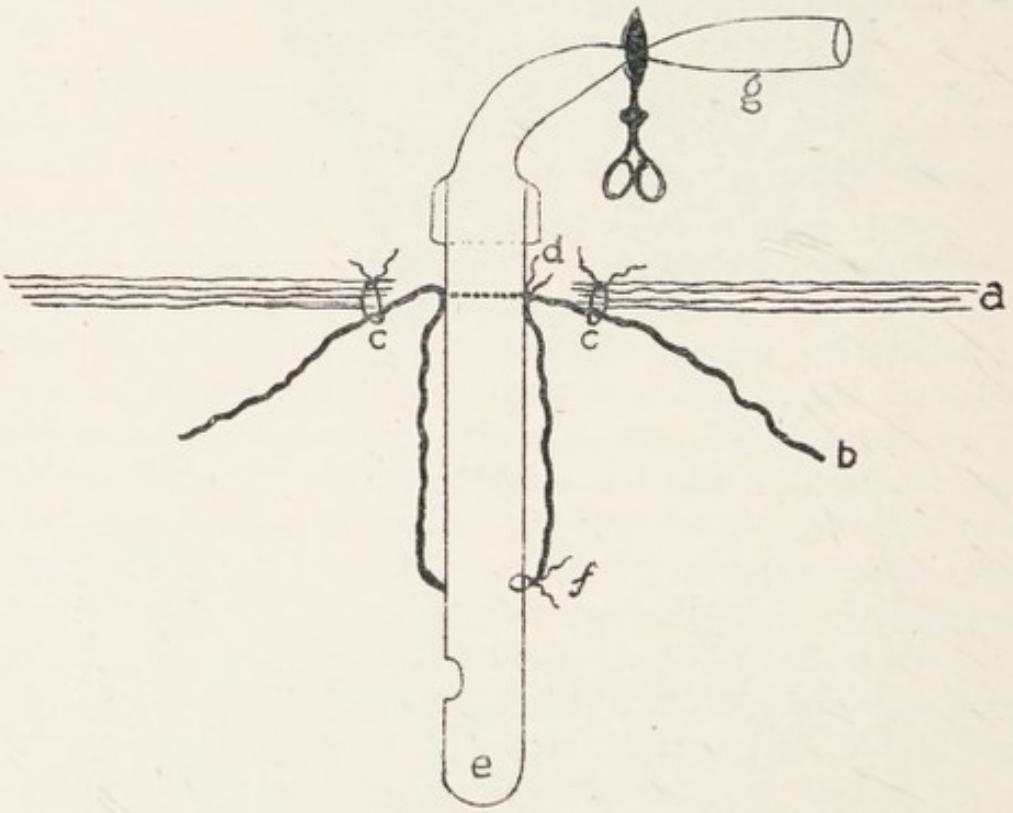


FIG. 18.—GASTROSTOMY (KADER-SENN METHOD).

a. Abdominal parietes. *b*. Gastric parietes. *c*. Suture of stomach to edges of parietal wound. *d*. "Purse-string" suture. *e*. Catheter. *f*. Suture of apex of gastric cone to catheter before invagination. *g*. Rubber tube fixed to catheter and clamped with forceps.

and the mucous membrane stitched to the skin. The lower wound is closed by a continuous suture.

Kader-Senn method (see Fig. 18).—This method of performing gastrostomy is probably one of the most recent. It appears to have been simultaneously practised by Kader of Breslau and Senn of Chicago, for which reason I have called it the Kader-Senn method. I have performed the operation three times, and think so highly of it that I am tempted to introduce it here. The operation is thus performed: An

incision is made either vertically in the median line, or to the left of it, or it may be the oblique subcostal incision of Fenger. The last is considered the best. The stomach is seized as near the great curvature as possible, and a cone is drawn out which is held either by a fixation stitch or a pair of forceps. The circumference of the base of this cone, which should measure in diameter about a couple of inches, is secured to the edges of the parietal wound, the extremities of which are closed to the required extent. The base of the stomach cone is now encircled by two purse-string sutures, the ends of which come out at opposite points. The apex of the cone is next incised, and through the opening a No. 8 gum elastic catheter is introduced into the stomach for about three inches of its extent and secured by a stitch to the gastric parietes at the apex of the cone. By now pushing in the catheter the cone is invaginated, and then by drawing upon the purse-string stitches the gastric parietes are puckered up and made to embrace the catheter, so that it becomes secure in position. The catheter is cut nearly flush with the wound and a small plug inserted into it, or a soft piece of tubing attached.

The catheter can be removed in a week or ten days' time, when it will be found that the parts have sufficiently healed to admit of easy feeding without any leakage or regurgitation. The operation can be easily performed in about thirty minutes. A full report of my first two cases has been given in the *Lancet*.*

It will be observed that the operation in principle much resembles that devised by Witzel. The difference lies in the position of the gastric fistula, which in Witzel's is oblique, while in the Kader-Senn it is direct.

Witzel's method (see Figs. 19, 20, and 21).—This is performed in the following way: The abdomen is opened by an incision extending obliquely about an inch below the costal margin. The stomach is then sought for, and the anterior wall brought out of the wound to as great an extent as possible. A small opening is made into the cavity of the stomach, into which is inserted an indiarubber tube, some six inches in length and about the thickness of an ordinary lead pencil. Two parallel folds of the stomach wall are pinched up and united together, by a series of Lembert sutures, over the tube which is applied to the stomach

* 1898, vol. ii. p. 475.

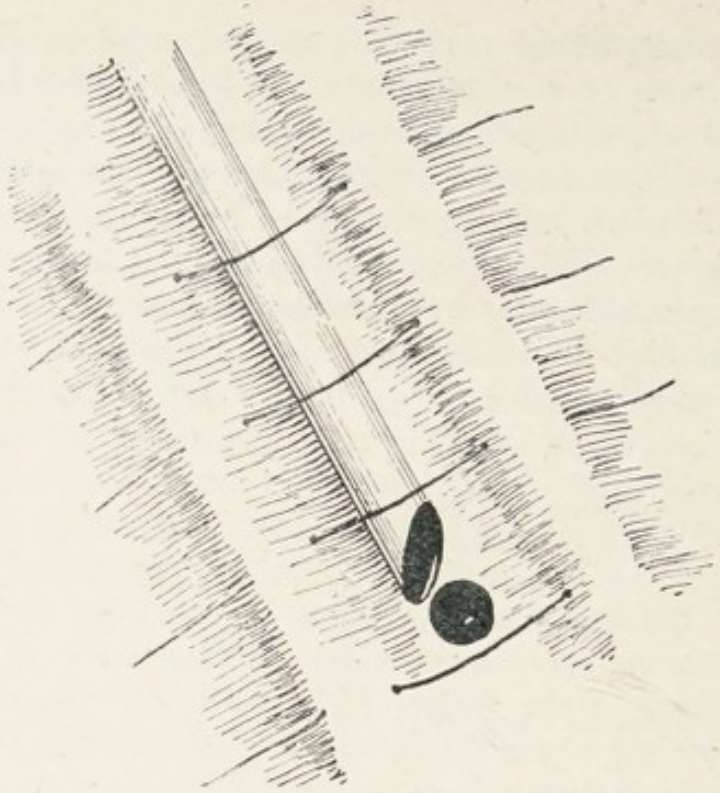


FIG. 19.

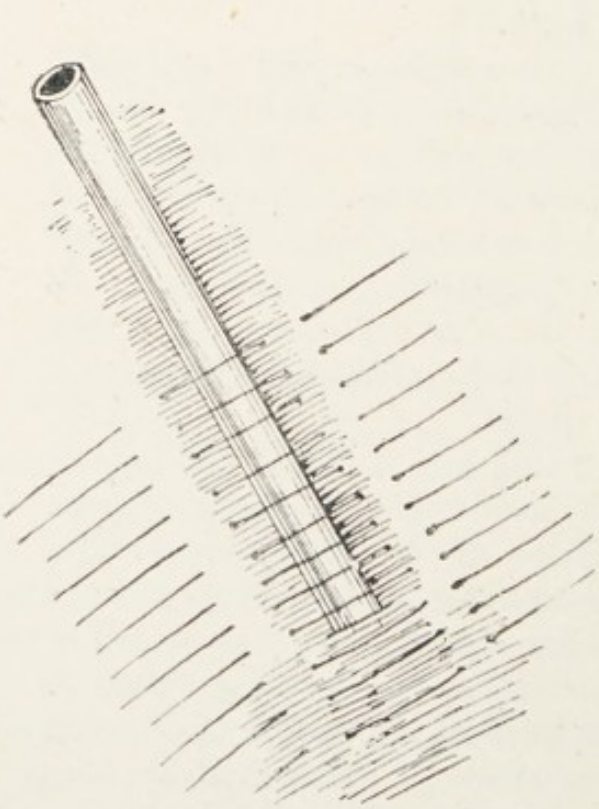


FIG. 20.

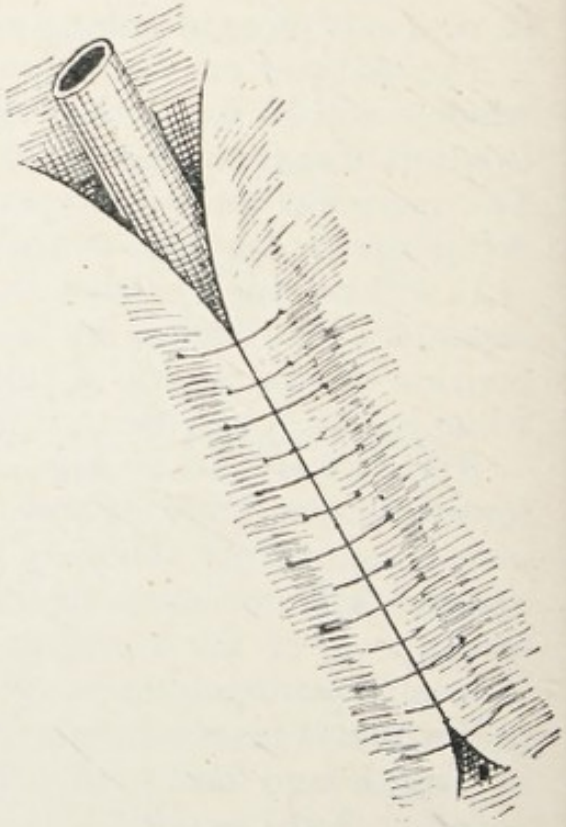


FIG. 21.

FIGS. 19, 20 AND 21.—Diagrams of Witzel's Operation, showing method of stitching the tube into the stomach in gastrostomy. (Meyer.)

wall. This oblique passage should be about two inches in length. The free end of the tube passes out of the abdominal wound, while the stomach is stitched to the parietes, and the rest of the wound closed. Before putting a plug into the tube, or clamping it with a pair of forceps, an ounce or two of milk may be inserted through it into the stomach. When, however, the condition of the patient will admit of two or three days' delay, it appears better to keep the stomach quite at rest and feed by nutrient enemata.

Among other methods for performing gastrostomy may be mentioned those of Jessett, Greig Smith, Hahn, and Von Hacker. I have fully described these operations in my larger work, and must refer the reader to it for them and the mention of other methods.

After treatment in gastrostomy.—For the few days succeeding the operation, the patient's strength may be maintained as much as possible by nutrient enemata. The wound may not need to be touched; and where vomiting proves troublesome after the anæsthetic, care should be taken to give good support to the abdomen by well applied binders or bandages.

Should the state of the patient be such as to require nourishment, there need be no hesitation in administering through the gastric fistula. Feeding may be effected in the following way, with such modifications as any particular operation may require:

A glass funnel or filler is attached to the indiarubber tube directly connected with the stomach, or to the piece of tube which has been affixed to the catheter, or to the catheter itself, if the latter is used as the direct means of communication. In either case the distance between the parietes and the filler should be about eighteen inches. The food first administered should be entirely liquid, so as to pass readily through the tube or catheter. It should be warmed and from five to ten ounces in quantity. The amount given should depend upon what the patient has been accustomed to take prior to the operation. In cases of almost complete obstruction of the œsophagus small quantities only should be administered at first. As to the nature of the food, milk with egg and some stimulant will be the most suitable medium to commence with; later, soups; and, finally, ground-up meats may be added. The frequency with which food should be given will depend upon the quantity which

the stomach can bear at a time. When only a little is taken, feeding will be necessary every hour or two.

Where a movable tube is temporarily retained, it should be changed every day, and finally removed when the fistula appears to be established. At this period the patient has usually learned to feed himself, and in some instances, after inserting the tube, he prefers to first masticate the food so as to enjoy the taste, and then eject it into the filler, by which, with the aid of some fluid, he is able to transmit it to the stomach. To enable the patient to introduce food of a more solid character, larger tubes have to be introduced. Although this may prove an advantage in one way, it renders the escape of gastric juice from the stomach more probable, and so is likely to give rise to troubles of skin irritation around the wound. In any case, when this complication arises, some artificial means must be adopted to try and prevent it. One method is to use the von Hacker-Scheimpflug canula, which consists of a double rubber balloon.

5. **Gastrectomy.**—The operation of gastrectomy consists in the removal of either a part of the body of the stomach, or, as we may now say, the entire viscus.

In preparing the patient for operation, the bowels should be emptied by copious enemata, and just prior to the operation a nutrient enema with some stimulant should be given. In cases where it is admissible, the stomach should be washed out for a few days previously, and also on the morning of the operation. The skin over the abdomen is cleansed in the usual way. The skin incision varies in position and extent according to the region of the stomach to be dealt with. As in most instances the first part of the operation is performed with the object of ascertaining the nature and extent of the disease, the incision is usually made in the median line. When, however, a distinct tumour is felt, the incision is carried in such a direction and to such an extent as will best enable that part of the stomach to be freely and easily dealt with.

To remove any portion of the body of the stomach the part to be excised should be drawn well out of the wound, and the peritoneal cavity shut off by sponges or cloths packed in around. To prevent the stomach from slipping away, when once well withdrawn, two silk "sling" sutures should be used, each suture being passed through both the serous and the muscle coats to an extent sufficient to give a

secure hold, and just outside the line of the part to be removed. If a choice exists of the direction in which the incisions may be made in the stomach, they should be carried transversely to the long axis of the organ. By this means fewer vessels will be cut than if the incisions were carried in the opposite direction, parallel to the greater and lesser curvatures.

After removal has been effected and the bleeding points secured, the lax mucous membrane is sutured by a continuous stitch, and the serous surfaces united by a series of Lemberts. The gastric wound being finally cleansed and the "sling" stitches and the sponges or cloths removed, the stomach is allowed to drop into the abdomen. The parietal wound is then closed and the usual antiseptic dressings applied, with a firm binder securely fixed over all.

The after treatment of the case should be in every respect similar to that described in cases of gastrotomy. Both the patient and the stomach should be kept as quiet as possible, all feeding for the first few days being by the rectum.

The operation of complete removal of the stomach has apparently up to the present been performed four times successfully.* Schlatter's case of a woman, aged 56 years, has been very fully reported.† The operation as executed by Schlatter, may be briefly described thus: The peritoneal cavity was opened by an incision in the linea alba extending from the ensiform cartilage to the umbilicus. After shutting off the peritoneal cavity with sterilised compresses, the stomach was isolated and the lesser and greater omentum severed from its two curvatures by means of a number of separately applied ligatures. The left lobe of the liver was now held up while the stomach was drawn upon to pull down as far as possible the œsophagus. By means of two clamps, the highest part of the œsophagus was secured, and the cardiac end of the stomach. Between these a severance of the canal was effected. The pyloric extremity was treated in the same way. An endeavour was made after freeing the duodenum as much as possible, to bring it up to the œsophagus, this, however, proved impracticable, so a loop of jejunum was seized, and stitched by its serous coat to the posterior part of the gullet. The bowel was then incised for a full half-

* Schlatter, Brigham, Childs-Macdonald, and Ribera y Sans.
† *Lancet*, 1898, vol. i. p. 141.

inch, and the mucous membrane united by a continuous silk suture to the mucous membrane of the gullet. "A suture of continuous muscular and serous tissue and a Lembert's interrupted silk suture were applied over the suture of the mucous tissue." The abdominal wound was lastly completely closed.

6. **Gastrorrhaphy.**—The operation of gastrorrhaphy consists in diminishing the size of an enlarged stomach, by doubling in a portion or portions of the wall, and stitching together the opposing folds.

Bircher, who was one of the first to practise this operation, operated upon three cases in the following way: "The stomach was previously washed out and carefully emptied. Parallel to the left edge of the ribs an incision six inches long was made, and the peritoneum opened. The stomach was drawn out. The edges of the wound being pulled apart and the lower edge being pulled upward, the greater curvature of the stomach was readily reached, and sewed to the lesser curvature by means of thirty-five silk stitches. This was aided by laying a long forceps on the stomach walls after fixing a suture at each end of the fold so that its weight pushed inward, for the time being, the stomach fold and allowed readier suture. The stitches were passed through the mucous and muscular layers. The wound was closed, and prompt healing took place." For six days thereafter, nutrition was carried on only by enemata; and on the twelfth day the patient was up.

I have twice operated successfully by this method, which is a very simple one, and rapidly executed. Other ways have, however, been adopted; thus a narrow longitudinal fold is first secured by a row of stitches, this is then tucked in and united by a second row, which is treated in like manner to the first, and thus a series of imbedded rows of stitches and folds is accomplished. Another plan is to introduce a series of interrupted stitches each of which passes in and out through the sero-muscular tunic; when each stitch is tied it puckers up into numerous folds the anterior gastric wall. A third method resembles Bircher's, except that instead of taking up one big longitudinal fold a series of small folds are taken up by separate rows of stitches.

7. **Gastropexy.**—Under this name Duret* describes an operation which he successfully performed for a

* *Revue de Chirurgie*, 1896, No. 6, p. 426.

case of displacement and dilatation of the stomach, called gastroptosis. The operation consisted in opening the abdomen and fixing the displaced pylorus and lesser curvature by sutures to the abdominal wall in their normal position.

8. **Gastro - enterostomy (gastro - jejunostomy, gastro-ileostomy, gastro-colostomy).**—By the operation of gastro-enterostomy is understood the formation of a permanent communication between the stomach and the bowel. The opening into the latter may be in any part of its course. It is most usual, however, that the connection is with the jejunum, hence the term gastro-jejunostomy. When the junction is with the ileum, it is strictly a gastro-ileostomy; and when with the colon, a gastro-colostomy. The operation described here will be the more commonly performed one of gastro-jejunostomy.

Proposed originally by Wölfler in 1881, it has been modified in various points of detail since; and it may still be said to be far from settled what is the best course to pursue throughout. The original plan of carefully stitching the stomach to the bowel has with many American and English surgeons given place to the more rapid means of uniting the surfaces by bone plates, metal buttons, or other like material. A disposition, however, exists on the part of many surgeons, especially in German schools, to practise the original method. Whichever method is adopted, the essential details require prominent attention. First, the operation must be performed as expeditiously as possible; and, secondly, the union of the bowel to the stomach must be absolutely secure. Failure in proper attention to one or both of these important details has been a not uncommon cause of an unsuccessful result.

The preparation of the patient for the operation has been fully discussed on page 157.

Wölfler's operation (*anterior gastro-jejunostomy*).—The skin incision is usually in the median line, between the ensiform cartilage and the umbilicus, and from three to four inches in length. After all bleeding points are secured and the peritoneal cavity opened, a search is made for the end of the duodenum. This is best effected, and with most certainty, by first turning the omentum up and to the left, and then taking the first loop of intestine felt in the left hypochondrium.

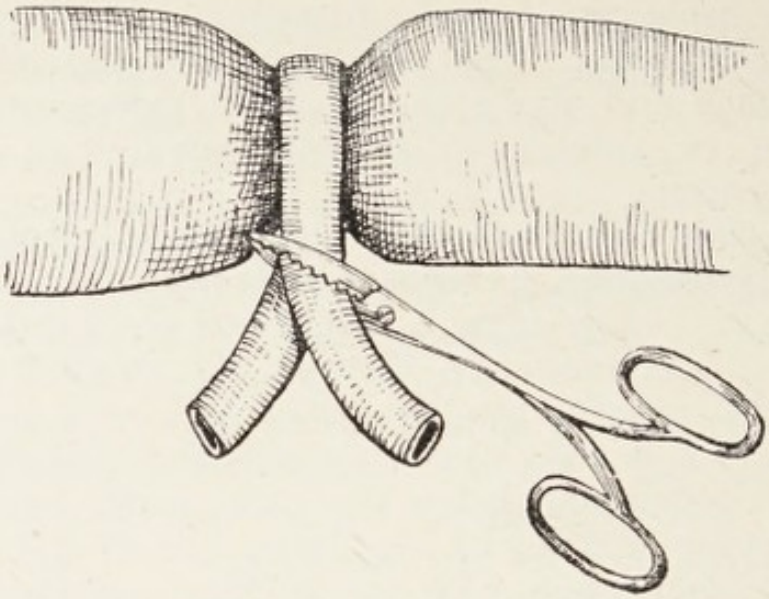


FIG. 22.—Method of Clamping Intestine with Rubber Tube and Forcipressure Forceps. (Barker.)



FIG. 23.



FIG. 25.



FIG. 24.

Figs 23, 24, and 25 show one pair of dissecting forceps with blades open and rubber tubes on blades ready for use; and a second pair with blades closed by passing a small piece of tube over the points of the blades. (Maylard.)

Trace up that end of the loop which appears most likely to lead to the duodenum, and when thus verified select a portion which when applied to the stomach will not cause traction. If the bowel is to be applied to the anterior wall of the stomach, the point for union will be about fifteen inches from the duodenum, while if union is to be with the posterior wall, this point need not be so far. The loop of the bowel chosen should then be clamped—that is, after squeezing the contents away in both directions, the gut should be encircled at two places about three or four inches apart, either

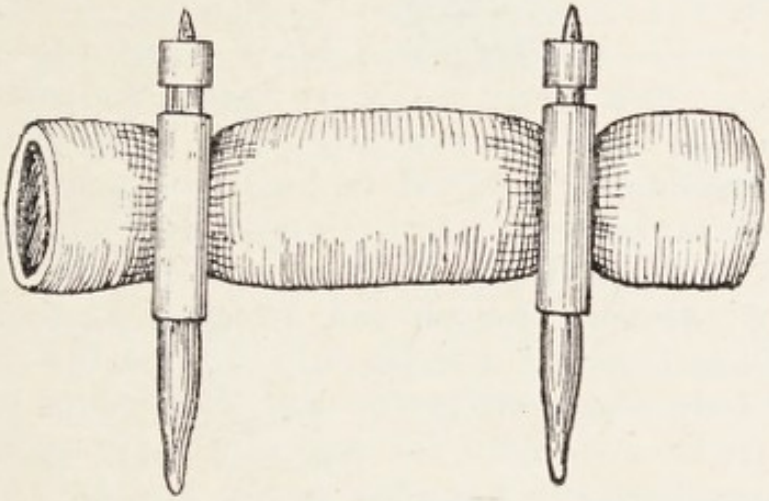


FIG. 26.—Shows two pairs of Dissecting Forceps clamping the Bowel.

by a piece of indiarubber tubing, made to perforate the mesentery, tightened and secured by a pair of catch forceps (see Fig. 22), or by two pairs of dissecting forceps. This latter method I have adopted on several occasions and found it easily and rapidly done. On to each blade of the forceps a piece of rubber tubing is previously slipped. One blade is forced through the mesentery close to the bowel, and the two blade-ends are then clamped by a piece of tubing slipped over both (see Figs. 23–26). A third and very simple method I saw adopted in Billroth's clinic. A few strands of worsted which had been properly sterilised were twisted together so as to make a soft cord. Two pieces of these were passed through the mesentery and tied moderately tight around the bowel. In whichever way secured, the loop of bowel is laid upon the abdomen and carefully protected with warm cloths. The stomach is next sought for.

The part of the anterior wall selected should be nearer the pylorus than the great cul-de-sac. The organ is drawn as far as possible outside the wound. Sponges or cloths, secured with a long thread of silk so that they can be easily withdrawn are packed around the protruding viscera inside the peritoneal cavity. The loop of bowel is next uncovered and applied to the stomach in such a way that when the communication is established the contents of the stomach will be driven into the bowel in the direction of the normal peristalsis of the latter. This important detail was suggested by Rockwitz, and is sometimes expressed as giving a half-turn to the loop. Prior to the opening of either viscus a row of stitches may be placed below where the incision is to be made. This serves to secure better the parts in position when the openings are cut. This preliminary union of the parts should be about an inch and a half from the greater curvature. An incision about an inch and a half in length is made in the long axis of the bowel, and an incision of the same length and direction in the stomach. Each of these incisions is made only through the serous and muscular coat, the mucous for the time being remaining intact. Union is effected for part of the circumference by stitching together the apposing serous and muscular coats. The mucous coat is then punctured in each viscus, and the openings enlarged to a sufficient extent. As at this stage the cavities of the two viscera are opened, great care must be taken that escape of either the gastric or intestinal contents does not contaminate the serous surfaces around. The apposing free margins of the mucous membranes are united by a continuous suture or by a series of interrupted sutures of silk or gut, and when thus a complete mucous channel is established, the remaining part of the circumference of the ununited serous surfaces is completed. The method of suturing adopted is that known as the Czerny-Lembert. (For the application of the various sutures used in gastro-intestinal surgery, see the chapter upon the Operations upon the Intestines.) The part, after being cleansed, should be finally examined by rotating it round, which can usually be easily done. At any point where there appears inefficient apposition of surfaces a Lembert suture should be inserted. To avoid kinking or bending of the bowel, a few additional Lembert stitches should be passed between the

gut and the stomach for an inch or so beyond those employed for the union of the two orifices.

Any sponges or cloths inserted for protection into the abdominal cavity are removed, and the sutured parts allowed to drop back into position. The abdominal wound is closed and dressed in the usual way, and a firm binder applied around the abdomen.

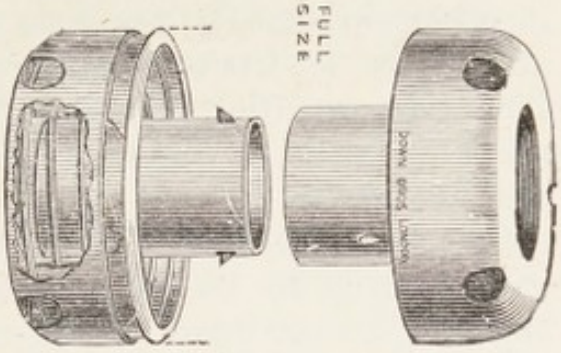


FIG. 27. FIG. 28.

FIGS. 27 and 28.—Murphy's Button.

Fig. 27 shows male half of button, which has a spring flange for keeping up pressure as atrophy proceeds. The two springs projecting through the fenestra in the hollow stem act as the male thread of a screw when the shank is telescoped within the stem of Fig. 28; Fig. 28 shows the female half of the button.

The needles used for uniting the bowel and the stomach should be the ordinary sewing needles—that is to say, needles without cutting edges—curved to nearly a half-circle.

Kocher prefers to unite the bowel to the anterior wall of the stomach in such a way that the afferent segment lies posterior to the efferent. The incision into the gut has therefore to be transverse and is cut valve-shaped to prevent regurgitation into the stomach. For other details in connection with this method, Kocher's work on operative surgery should be consulted.*

As another mode of preventing regurgitation, an anastomosis between the afferent and efferent segments of the bowel going to the stomach has been practised (jejuno-jejunostomy). It adds much, however, to the length of the operation.

Von Hacker's method (*posterior gastro-jejunostomy*).—The first steps of the operation, as far as concerns the opening of the peritoneal cavity, resemble Wölfler's. The great omentum with the transverse colon is turned upwards; an opening is made in the transverse meso-colon, and the posterior wall of the stomach exposed. After selecting a point in the loop of jejunum to be united to the stomach, the parts around are carefully packed to secure

* See Translation, Edition by Styles, p. 130.

the peritoneal cavity against any contamination from the escaped contents of the stomach or bowel. The union may now be effected either by stitching, as in the "anterior" operation, or by the use of Murphy's button. (See Figs. 27 and 28.) The "button" seems to answer admirably; it takes very much less time in completing the operation, and there is little fear of its slipping back (or rather forwards) into the stomach. Czerny, in his recent report, speaks highly of its use, and has now given up other methods in its favour. I used it in my last four cases, and could have wished for nothing better. If, then, the operation is to be completed by the use of the button, the surgeon proceeds to open the stomach by an incision a little over half an inch long. While an assistant holds the edges of the wound, so as to prevent the escape of the gastric contents, the operator runs a purse-string suture around the margins of the orifice. One half of the button held by a pair of catch forceps and plugged with a piece of tissue is inserted into the stomach; the purse-string is then tightened and the part taken charge of by an assistant, while the operator proceeds to deal similarly with the bowel and the other half of the button. The button plugs are removed and the two halves pressed together. Usually this completes the operation, but should any doubt exist as to the proper co-aptation of the two halves of the button, it is wiser to insert a few interrupted Lembret sutures around it. To avoid any risk of a constricting effect produced by the opening in the transverse meso-colon, its edges should be secured to the stomach wall.

After the parts have been properly cleansed, the protective padding is removed, the colon and omentum replaced, and the parietal wound completely closed.

After treatment.—If the patient's strength will admit, it is as well to give the stomach complete rest for the first twenty-four hours or longer, all nourishment being administered in the form of rectal enemata. No hesitation, however, should be had in giving a little peptonised milk, or chicken tea, with stimulants by the mouth, if the condition of the patient seems urgently to demand it. When regular feeding is commenced it should be gradual in quantity and of such a nature as to be easily digested.

Other methods of operating.—Various other methods have been adopted for uniting the bowel to the stomach. Thus absorbable plates of various descriptions have been made use of, prominent among which are Senn's decalcified bone plates. I must, however, refer the reader to my larger work for the description of these different methods; suffice it to say that experience has now caused them all, more or less, to be replaced or supplanted by one or other of the operations above described. Rutherford Morison has practised with success a method worthy of notice. The gut is severed below the duodeno-jejunal flexure. The distal part is connected with the anterior surface of the stomach, while the proximal end is implanted into the jejunum lower down. By this method there is less liability to regurgitation of the bile and pancreatic juice. The operation will, however, take more time in performing than some of the other methods.

Untoward results of operation.—It is well to indicate some of the many sources of failure and troublesome after effects which are to be met with after the adoption of almost every method.

(1) *Regurgitation of the contents of the bowel into the stomach.*—The effect of this upon the patient is extremely distressing. Eructations of fœtid gas and fæcal matter cause the tongue to become dry and brown and the mouth very foul. Great relief is obtained by freely washing out the stomach. This should be repeated as often as deemed necessary. This troublesome after effect was much more common at one time than at present. It is now rarely seen as a sequel to the "posterior" operation, nor to the "anterior" when performed according to Kocher's valve method.

(2) *Pain.*—Acute pain is sometimes felt in the region of the stomach wound. At times slight, it becomes suddenly augmented by sharp stabs which cause the patient to cry out. More general pain over the abdomen indicates peritonitis. Opium by the bowel, or morphia subcutaneously, should be given.

(3) *Persistent vomiting and hiccough.*—This sometimes is very troublesome, and if it does not portend a rapidly fatal result from peritonitis or obstruction, it may indicate at a later period a reclosure of the artificial opening.

(4) *Suppression of urine.*—In one of my cases this proved absolute. No urine was passed from the time of the operation till the patient's death about four days later.

(5) *Collapse.*—In most of the earlier cases collapse was one of the commonest causes of death. The patient rallies but slightly, if at all, from the operation, and dies within a few hours. The greater shortening in time occupied by the operation has greatly reduced this after effect.

(6) *Exhaustion and inanition.*—Usually already in a more or less exhausted condition at the time of the operation, the patient's strength proves insufficient to survive the period necessary for the proper healing of the parts and the introduction of sufficient nourishment. Death occurs in a few days. The earlier period at which the operation is now performed is tending to lessen this untoward sequel recorded.

(7) *Hæmorrhage.*—In one case subsequent hæmorrhage caused a fatal result on the fourth day. In this instance no vessels had been secured by ligature at the time of the operation, pressure alone was used. The weakness of the patient at the time of the operation was probably the cause of the slight bleeding, and hence certain vessels escaped observation which would otherwise have been seen and properly secured, and thus the reactionary hæmorrhage checked.

(8) *Peritonitis.*—Either as the result of leakage, or inefficient "toilette" at the time of operation, peritonitis has proved no uncommon cause of a fatal result. Acute and general, it may cause death in twenty-four hours; or if more localised and less acute, a more sluggish purulent form may cause death in a few days.

(9) *Gastric fistula.*—As the result of insecure stitching, coupled also sometimes with violent vomiting or retching, a leakage takes place at the line of union of the two viscera. If adhesions have sufficiently formed between the visceral wound and the parietes, the parietal wound gives way, and a complete communication exists between the stomach and the exterior. All nourishment given by the mouth passes out through the fistula, and the patient dies of inanition.

(10) *Intestinal obstruction.*—Obstruction in the bowel may arise from one of two causes. Either as the result of

some obstruction in the bowel itself, from impaction of the plates used for co-apting the visceral surfaces, or from a kinking or constriction of the part. In two at least recorded cases death has been caused by the bowel kinking just beyond its point of union with the stomach. The bowel falling sharply away from its sutured surface forms a bend which efficiently stops any onward passage of the contents of the stomach. Any suspicion of such an accident should be treated by turning the patient on to the right side, or even into a semi-recumbent position. Constriction of the bowel may occur at the opening made in the meso-colon to pass the jejunum through before uniting it to the posterior wall of the stomach. Obstruction in the transverse colon may be produced by the loop of intestine which is carried over it to be stitched to the anterior wall of the stomach.

(11) *Subsequent closure of the bimucous fistula.*—The recurrence of symptoms some weeks or months afterwards may indicate the contraction or closure of the communication between the stomach and the bowel. Unfortunately this is a sequel to almost all methods of operating. It seems, however, that it is likely to be least marked after the use of Murphy's button, because with this there is probably some removal of tissue—that which is more or less strangulated between the two halves when pressed together.

(12) *Opening the ileum in place of the jejunum.*—In more than one instance this mistake has been made at the operation. Lauenstein records having united the ileum to the stomach at a point sixteen inches from the ileo-cæcal valve. The error is subsequently detected by the passage *per rectum* of food in a practically unchanged condition. Death occurs, as in gastric fistula, from inanition.

(13) *Pneumonia.*—Several deaths from pneumonia have now been recorded.

(14) *Murphy's button.*—Various accidents have been recorded resulting from the use of Murphy's button, not, however, all connected with its use in gastro-jejunostomy. In this particular instance it has sometimes fallen back into the stomach when used for the anterior operation. It has also cut its way too soon through the tissues, and so led to perforation. Its lodgment in the bowel has caused obstruction.

The time which the button takes to pass per rectum is extremely variable. It depends greatly, I believe, upon the tightness with which the two halves are pressed together. When firmly driven home they are much more likely to become detached earlier than when less forcibly co-apted. In some instances it has been months before the button has appeared in the motions, and its prolonged retention has not caused any untoward symptoms. In several of Czerny's cases it was never detected. It need hardly be said that its intra-abdominal existence may possibly be determined by the use of the Roentgen rays.

9. **Pylorectomy.**—The operation consists in total extirpation of the pylorus, together with the disease which implicates it. It therefore frequently embraces a considerable portion of the pyloric end of the stomach, as well as—in exceptional instances—a portion of the first part of the duodenum. The duodenum is then united to the stomach.

The preparation of the patient is in every respect similar to what has already been described in the preceding operations. (See page 157.)

The skin incision, from four to five inches in length, is made in the median line above the umbilicus.

As soon as the abdomen is opened, the fore and middle fingers of the right hand are introduced to ascertain the condition of the tumour with regard to its size, freedom from adhesions, and extent of involvement of stomach, duodenum, and omenta, and also the existence or not of enlarged lymphatic glands. A few sponges or cloths secured with long pieces of silk are placed within the abdomen for protective purposes. The small omentum above is first severed from its connections with the upper border of the part to be removed. This is best effected by using an aneurysm needle threaded with gut or silk, and made to take up small portions of the omentum. A double ligature is passed, and the strand with its contained vessels divided between the two ligatures. When sufficiently freed, the forefinger of the right hand can be passed beneath the tumour and made to push its way at various points through the gastro-colic omentum close to its upper attachment, the membrane itself being severed in a similar

way to the lesser omentum. I found this a very easy, rapid, and secure way of dealing with the lower omentum The tumour thus freed from all attachments is brought out of the abdomen and a large flat sponge or cloth placed beneath it, to protect the abdominal cavity from contamination from either the gastric contents or other external sources. At this stage enlarged lymphatic glands should be removed.

The next stage of the operation, or, as it is sometimes termed, the third stage, consists in the removal of the diseased parts.

By means of a pair of scissors the duodenum is first cut through just beyond the pylorus. To prevent any escape from either end of the divided bowel, each portion is taken charge of by a separate assistant. As soon as the division is effected and all bleeding points secured, the duodenum is either clamped or tied round with a piece of rubber tubing. In some instances it is sufficient to stuff a piece of sponge or lint into the canal. In place of an assistant to take charge of the duodenum, it may be clamped or tied prior to division. The surgeon next turns his attention to the stomach. The cut in this viscus depends to some extent upon the manner in which, in cases of carcinoma, the growth has involved the organ. The assistant, with the stomach grasped near the tumour, between the thumbs and fingers of both hands, everts the pyloric orifice, so that as the surgeon cuts through the stomach, nothing is permitted to escape from it. From this point onwards the steps of the operation depend upon the particular method which is to be employed in establishing the continuity of the canal. If it be decided to stitch the duodenum to the free edges of the stomach, the operation will be continued as follows: Before complete severance of the tumour and after all vessels have been secured, the open part of the stomach may be closed by a series of interrupted Lembert stitches, or by a continuous suture. In the former case the stitches should all be left long, their free ends being caught up together with a pair of forci-pressure forceps. The advantage of this is, that by pulling on the stitches some manipulation of the part is made possible while effecting union with the duodenum.

After completing the section and securing any further bleeding points, the duodenum is applied to the orifice in the stomach. Stitching is commenced by uniting the posterior margin of the orifices first. This is effected from within, sutures being passed by a small curved needle with needle-holder and made to pick up and unite together the mucous membrane. As described by Jacobson—"They are passed first at the cut edge of the stomach between the mucous and muscular coats, carried on between the muscular and serous, then through the same layers of the duodenum, and finally brought out between these layers and the mucous membrane at the cut edge of the duodenum. When the posterior aspect of the two viscera is thus soundly closed, the anterior one is united by Lembert's suture. If the cut mucous membranes do not come accurately together, a few sutures may be put in here separately from within. Care must be taken in inserting the sutures to avoid the formation of folds (Billroth)." A weak point in the line of suture is at the angle of closure of the stomach. This should be particularly looked to before returning the parts.

At the completion of the union of the two viscera, a few stitches should be inserted to unite the edges of the severed omenta to the upper and lower borders of the newly formed parts.

The sponges or cloths are finally removed, the wound itself being carefully cleansed before dropping the parts back into the abdominal cavity.

Some important modifications of the operation, serving to shorten the time of its performance, have been successfully carried out. Thus Murphy's button has been used for joining the two divided ends of the viscera; Senn's plates have also been employed.

Kocher's method of pylorectomy.—The particular feature of the operation is the implantation of the free end of the duodenum into a newly made opening in the posterior wall of the stomach—the free end from which the tumour has been excised being completely closed by suture.

The preliminary details of the operation are practically those already described above. After the pylorus and the diseased parts have been excised, the opening in the stomach is closed first by a continuous suture which embraces all

three coats; this line of suturing is then invaginated, and a continuous Lembert suture introduced to approximate accurately the serous surfaces. The stomach is then everted in such a way as to admit of the cut end of the duodenum being applied to it. After securing by means of a "continuous posterior serous suture" the posterior half of the duodenal edge to the gastric wall, the stomach is incised to an extent corresponding to the breadth of the duodenal orifice. A single "posterior continuous suture" is passed through all three coats. The ends of the posterior sutures which have been left long are now used for completing the union of the serous surfaces in front.

There are four points to which Kocher directs especial attention: (1) The avoidance of the use of all antiseptic solutions and the employment only of normal saline solution, with otherwise the greatest possible care regarding asepsis. (2) The use of the continuous suture. (3) The employment of clamps (long catch or force pressure forceps), one for the duodenum and two for the stomach, applied as far as possible beyond the seat of disease, and (4) the maintenance of the patient on the right side after operation, so as to avoid regurgitation.

The combined operation of pylorectomy and gastro-enterostomy.—This operation consists in the excision of the pylorus with the affected parts; complete occlusion of both bowel and stomach, and union of the jejunum with the latter.

The earlier stages of the operation are in all respects similar to those of pylorectomy up to the point where the tumour has been freed from its omental attachments and brought out of the abdomen. While the stomach is secured by the hand of the assistant, the surgeon proceeds to cut with scissors completely through the viscus beyond the affected part. The duodenum with the attached growth is turned aside outside the abdomen, and any escape from the internal parts prevented by the application of clamp forceps. The bleeding points in the edges of the divided stomach wall being secured, a continuous suture of fine silk is made to occlude the gastric cavity by passing through the entire thickness of the stomach coats. A second line of sutures is then made, in order to bring the serous surfaces well

and securely into contact. This may be effected either by a series of Lembert's or by quilt sutures. The stomach is then dropped back for the time being into the abdomen.

The tumour is next severed from its attachments to the duodenum. A clamp or rubber band is made to embrace the duodenum outside the point where the division of the gut takes place. The orifice of the bowel is then closed in the same way as that of the stomach, and when completed and cleansed dropped back into the peritoneal cavity, after removal of the clamp.

The stomach is again brought out of the wound, and the operation of gastro-enterostomy proceeded with by one of the methods already described.

The combined operation has been performed successfully in the reverse way, and at two different periods. Thus the gastro-enterostomy is first executed, and then at an interval of a week or two the pylorus is excised.

10. **Pyloroplasty, or Heineke-Mikulicz operation.**—The operation consists in dividing the strictured pylorus much in the same way as an urethral stricture is treated by external urethrotomy, but in addition, the wound so formed is reunited in the opposite axis to that in which the original cut is made. The patient is prepared in the usual way for operations upon the stomach. (See page 157.)

After opening the abdominal cavity by a medium incision above the umbilicus, the anterior wall of the usually dilated stomach is sought for and withdrawn out of the parietal wound. The parts beneath are protected with sponges or cloths.

A small longitudinal incision is made in the anterior wall of the stomach just at the boundary of the pylorus, of sufficient size to admit the finger. The contracted orifice is sought for by the index-finger of the right hand, which serves as a guide for the passage of a director through the stricture into the duodenum.

By means of a blunt-pointed bistoury the pylorus is completely divided. Such bleeding points as need securing are ligatured. The longitudinal incision is then converted into a transverse wound by a double series of sutures, so applied

as when tightened to bring the most distant points together, and make the middle of the two edges the most distant points of the new wound (see Figs. 29–32). The parts are

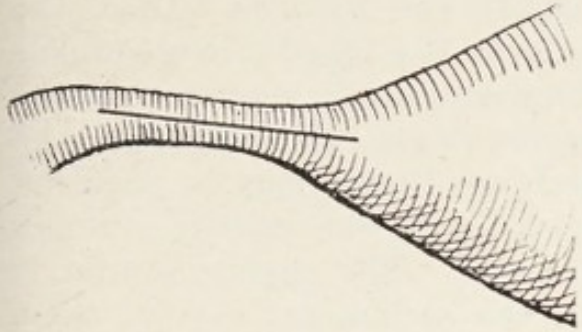


FIG 29.

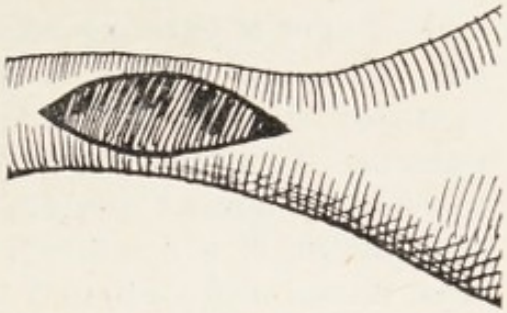


FIG. 30.

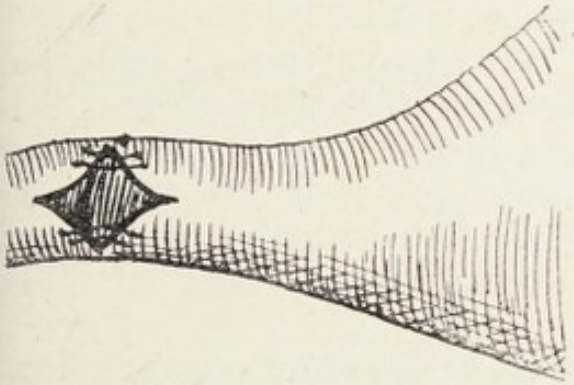


FIG. 31.

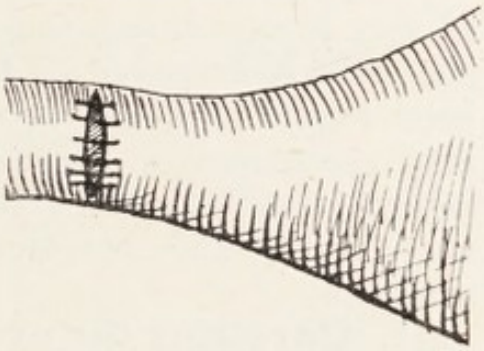


FIG. 32.

FIGS. 29-32.—HEINEKE-MIKULICZ OPERATION OF PYLOROPLASTY.

FIG. 29 shows line of incision through constricted pylorus; Fig. 30 shows the appearance of the parts after division of the stricture; Fig. 31 shows method of suturing the wound; Fig. 32 shows the suturing completed.

then returned, and the parietal wound closed and dressed in the usual way.

11. **Digital divulsion of the pylorus, or Loreta's operation.**—This operation consists in first performing gastrotomy, and then forcibly dilating the orifice of the pylorus with the fingers.

The preparation of the patient is the same as already described for other operations upon the stomach. (See page 157.)

"The operation is performed by introducing the right fore-finger into the stomach through the gastric incision made about an inch and a half from the pylorus. To commence dilatation by forcing in the finger, the left finger must also be introduced in order to steady the pylorus. Once the right finger is through, the pylorus is hooked down towards the abdominal wound, a manœuvre which may enable the operator to get the left index-finger also through the pylorus. Considerable and prolonged force may be required to effect sufficient dilatation, owing to the powerful reflex contraction of the sphincter muscle. The gastric wound is then closed and returned into the abdominal cavity. The parietal wound is stitched and the usual antiseptic dressings applied. If considered advisable, nourishment may be given by the mouth a few hours after the operation."

Simple as the operation appears, it is far from being devoid of very grave consequences. With less stretching than that successfully exercised by Loreta, the wall of the stomach has been ruptured, death resulting in four hours. The orifice may recontract or become obstructed, and the symptoms return as early as the fifth day. Considerable hæmorrhage may result, the bleeding taking place freely into the stomach.

12. **Curetting the pylorus, or Bernay's operation.**—The operation consists in first performing gastrostomy and curetting or scraping away that portion of the growth which obstructs the pyloric orifice.

The operation as successfully performed by Bernays was thus carried out: After the usual preparations, gastrostomy was performed. The stomach was first washed out with warm water. Then the finger was introduced, and a considerable quantity of the tumour removed by it. "By means of the largest sizes of Simon's sharp spoons I scooped out all the soft masses until a grating noise was produced by the instruments against the indurated base of the tumour. . . . A current of cold carbolised water was next turned into the stomach and was allowed to run until the fluid returned clear." This operation is only temporary in its effects, and must be repeated if the pyloric orifice is to be kept free. It has received but little recognition as treatment for malignant disease.

PART III

THE SMALL AND LARGE INTESTINE

THE SMALL AND LARGE INTESTINE

SECTION I.

THE DUODENUM.

CHAPTER XXII.

ANATOMY. INJURIES: RUPTURE; FOREIGN BODIES.

Anatomy.—The duodenum, so called from its length, being about equal to the breadth of twelve fingers—that is, from ten to twelve inches—forms the upper of the three portions into which the small intestine is arbitrarily divided. It is the widest part of the small bowel, varying in diameter from an inch and a half to two inches, and takes a course which may roughly be described as horseshoe in shape, with the convexity of the curve to the right.

Commencing at the pylorus, it is directed slightly upwards and backwards to the right to the neck of the gall bladder. It measures about two and a half inches in length, and constitutes the first or superior portion. Its relations are—in front and above, the liver and gall bladder: behind, the gall duct and the hepatic vessels. It is entirely surrounded by peritoneum.

The second or descending portion extends from the neck of the gall bladder downwards to the body of the third lumbar vertebra It is in contact in front with the transverse colon and meso-colon. Behind, it is connected by areolar tissue with the right kidney and the vertebral column. To the left is the head of the pancreas. Descend-

ing behind the left border of the gut is the common bile duct, which, together with the pancreatic duct, perforate obliquely the walls of the bowel and, by a common orifice into its interior, open at a point about four inches from the pylorus. It is covered by peritoneum only on the anterior surface.

The third, transverse or oblique, portion extends to the left, ascending slightly from the right side of the body of the third lumbar vertebra to the left side of the second. Here it terminates by forming an abrupt angle with the commencement of the jejunum. In front and passing over the upper border are the superior mesenteric vessels. Behind are the aorta, inferior vena cava, and pillars of the diaphragm.

The mesentery commences where the duodenum becomes continuous with the jejunum. A notch, which can be felt in the peritoneum, serves as a guide to this particular part.

The part of the duodenum, about an inch long, which extends along the side of the left crus of the diaphragm opposite the second lumbar vertebra is sometimes termed the fourth, or second ascending, portion. It is firmly fixed to the front of the aorta and the crus of the diaphragm by a strong fibro-muscular band, which has been termed the "musculus suspensorius duodeni." By means of this ligamentous band the duodenum is held up as by a sling, and kept constantly in position (Treves).

In relation to the surface of the body, the duodenum occupies the right hypochondriac, right lumbar, and umbilical regions. On the right side, a little below the ninth rib, the hepatic flexure of the colon lies in front. A point about an inch above the umbilicus marks the place at which the transverse portion crosses the spinal column. Behind, the spine of the second lumbar vertebra is just above the duodenum.

In its minute structure the duodenum resembles the other parts of the intestine. Of the four coats—serous, muscular, submucous, and mucous—the first, as already indicated, only surrounds the bowel to a limited extent. As regards the mucous membrane, valvulæ conniventes begin to appear a short distance from the pylorus, and become very large in size just beyond the orifice of the bile and pancreatic ducts. Villi are present in abundance

throughout. The crypts of Lieberkühn are also found in its whole extent; and Brünner's glands, which are universally present, are found most abundantly a little way from the pylorus. The solitary glands exist throughout, but the agminated glands or Peyer's patches are only occasionally met with in the lower part. The cells which line the surface of the mucous membrane are of the columnar type.

The arteries supplying the part come from the pancreatico-duodenalis superior, a branch of the gastro-duodenalis, itself a branch of the hepatic; and from the pancreatico-duodenalis inferior, a branch of the superior mesenteric. These two arteries form a partial circle on its concave border, coursing between the duodenum and the pancreas. The further distribution of the vessels resembles that of other parts of the small intestine, and will, together with the lymphatic and nerve supply, be described when dealing with the minute anatomy of those parts.

Injuries.—The deep situation of the duodenum renders it comparatively secure against injury. Its fixed position, however, renders it less likely to escape than if, like other portions of the small bowel, it were freely movable.

While it may be injured by bullet or shot, or by stabs or sword thrusts, such wounds are always associated with similar injury to the overlying parts. The only injury which, it appears, may limit itself solely to the duodenum, is rupture produced by a direct blow or a squeeze upon the part.

Rupture.—It is perhaps doubtful whether rupture of the duodenum is of such frequent occurrence as alleged by Erichsen, who appears to base his statement rather upon the supposition that it must be so from the anatomically fixed position of the part than from actual experience. Most authors speak of the accident as an extremely rare one.

Symptoms.—There are no symptoms special to the injury; such as appear are variable and indistinguishable from those which arise from rupture of the small bowel elsewhere.

The patient immediately on receipt of the injury complains of pain more or less intense and continuous. Usually it is felt in the epigastric region, but sometimes in other

parts. The amount of shock which follows varies. When the injury is produced by a sharp blow, the resulting shock appears to be more marked than when it follows upon a severe squeeze. Physical examination of the abdomen may reveal but little. The skin is usually intact, and manipulation of the belly may or may not elicit tenderness.

Vomiting usually takes place at some period after the injury, and as a rule the vomit does not contain blood. If death does not result from the primary shock, the patient generally rallies for a time, but sinks sooner or later in a condition of collapse.

The symptoms which develop later are those referable to general peritonitis.

As regards the seat and nature of the rupture, the most frequently injured part is that which crosses the spine, and where therefore it is most fixed; and the lesion, which is usually on the anterior surface, varies from what may be a comparatively small perforation to a complete severance of the entire circumference.

Treatment.—While all the ordinary measures are being adopted to secure rest and relief of pain and shock, the chief consideration centres upon the question of operative interference. Whatever arguments are used for or against an exploratory operation in cases of rupture in other parts of the bowel must apply here, for the very reason that it is usually impossible to diagnose rupture of the duodenum from rupture elsewhere. Hence, as no question can be raised as to the advantage of opening the abdomen in cases of rupture, for instance, of the jejunum, none can be entertained with regard to a like injury to the duodenum. If it should ever prove possible to diagnose with any degree of certainty such a lesion as here discussed, there might be some reason for considering the arguments which Hutchinson brings forward for conservative measures, in the paper which he wrote in connection with his own case. It is quite possible to conceive that with an organ so deeply situated, so fixed, and so well covered by the close apposition of other parts, healing might take place and a good result accrue, where operative interference would prove harmful. It is quite reasonable to suppose that such good results have happened; it is, however, quite impossible of course to know. The only question therefore which can be raised

concerns the proper time when to operate. To attempt any grave measure when the patient is in a collapsed condition is likely to prove as useless as to operate when peritonitis has well set in. The proper time therefore is after the primary shock has passed away; this will usually be in the course of a few hours.

In most, if not all, cases the diagnosis will be purely conjectural; conjecture, however, will give place almost to certainty if the surgeon, on opening the abdomen, finds by the presence of gas and possibly extravasated material the evidence of rupture, yet can detect no lesion in any part of the stomach, jejunum, ileum, or large intestine. A careful examination of the duodenum will then probably reveal the lesion.

For details concerning the treatment of the rupture, the reader must refer to the discussion of the subject in connection with similar lesions of the jejunum and ileum; suffice it to say here briefly, that an attempt should be made to close the severed parts by suture. Not the least important of all treatment is the efficient washing out of the peritoneal cavity. This part of the treatment itself might, in the case of a small lesion, prove sufficient. The sole after danger is peritonitis, and the sole prevention is early operation, and thorough cleansing of the peritoneal cavity.

Foreign bodies. — The lodgment of foreign bodies within the duodenum is of such rare occurrence that little more than a passing notice is necessary. The large calibre of this portion of the small intestine enables most foreign bodies which are able to pass the pylorus to find their way lower down before becoming impacted.

CHAPTER XXIII.

DISEASE. SIMPLE OR CHRONIC ULCER. ACUTE ULCERATION.

"In no part of the alimentary canal are the diseases to which it is liable so obscure in their origin and diagnosis as in the duodenum." These words, written more than fifty

years ago by Curling, still remain applicable at the present day. It is almost as difficult now as it appears to have been then to distinguish diseases of this part of the bowel from like affections occurring elsewhere in the immediate neighbourhood.

The diseases here selected for treatment are only such as are of interest to the surgeon.

Simple or chronic ulcer.—This form of ulcer resembles in every respect the simple chronic ulcer of the stomach. Not only in its pathology, but in the symptoms to which it gives rise and in the course which it pursues, it shows a marked resemblance to that ulcer. Its one comparatively minor feature of difference lies in the fact that it is more frequently met with in males than in females.

The commonest age for the appearance of the ulcer is between 30 and 40 years. Instances, however, occur of its appearance both at very early and comparatively late periods of life.

With but few exceptions the ulcer is found within one or two inches from the pylorus; and it more frequently occupies the anterior than the posterior wall, but is sometimes found at the inferior border.

In most cases it is usual to find a single ulcer, but two or more are sometimes present, and now and again an ulcer is found in conjunction with a similar one in the stomach.

Symptoms.—Although extremely variable, the symptoms may sometimes be sufficiently distinctive to warrant a positive diagnosis being made. Between the two extremes of no symptoms and pronounced symptoms there are all shades of severity. As in gastric ulcer, but more frequently than in that condition, the patient may be in perfect health until suddenly struck down with symptoms which may prove fatal in a few hours.

In an exhaustive paper on the differential diagnosis between gastric ulcer and duodenal ulcer,* Bucquoy attaches most importance to the following symptoms as distinctive of the latter: (1) Copious and sudden hæmorrhage by the bowel; (2) the position of the pain, at a zone corresponding to the inferior border of the liver and between the border of the false ribs and the iliac crest; (3) to certain

* *Archives Générales de Médecine*, 1887, vol. i. pp. 398, 526, 691.

digestive troubles, of which the most important are acute attacks of colic, occurring three or four hours after the ingestion of food.

That duodenal ulcer may be present and yet the symptoms manifested none such as depicted here, is sufficiently attested by numerous published cases. The severity of the pain and its period of appearance is very variable. In some instances it is very acute, doubling up the patient while it lasts. While it is said to appear usually from two to four hours after a meal, it sometimes occurs within half an hour.

Hæmorrhage, when present to any extent, is almost always manifested by a copious discharge of blood *per rectum ;* in some cases it is accompanied with hæmatemesis, and, when so associated, more frequently than not leads to a mistaken diagnosis of gastric ulcer.

In weighing the relative diagnostic significance of hæmorrhage by the bowel and hæmorrhage by the mouth, bleeding from a gastric ulcer is likely to be more abundant by the latter than *per rectum*, while in duodenal ulcer the converse will probably be the case. In the case of recurrent small hæmorrhages from a duodenal ulcer, the blood passed *per rectum* will be tarry ; while in similar bleedings from the stomach, the blood passed will be more altered in character, due to the action of the gastric juice.

It may be incidentally pointed out, in speaking of melæna, that copious hæmorrhage, even to the extent of proving fatal, may take place from the bowel as the result of causes other than ulceration connected either with the stomach or the duodenum. See "Malignant Disease of the Colon and Rectum."

Prognosis.—There is every reason to believe that, like gastric ulcers, these duodenal ulcers undergo cicatrisation. The obscurity and difficulty which attend their diagnosis naturally render it impossible to say what proportion of cases recover. Bucquoy claims to have had four recoveries out of five cases.

The interest of these cases to the surgeon centres rather in the complications which arise in the progress of the disease than in the simple uncomplicated disease itself. The question of the excision of a simple duodenal ulcer has not yet entered into the practical domain of surgery,

as it has done in the somewhat analogous case of gastric ulcer, although there is no reason why it should not. Up to the present the surgeon has mostly to deal with the results of ulceration, either in the way of perforation, or in its later after effects, stricture.

The occurrence of hæmorrhage generally lends a somewhat serious aspect to a case, and the more so the larger the quantity of the blood lost at any particular time. Not a few cases are recorded where death has suddenly resulted from excessive hæmorrhage. In this particular class of cases the ulcer is always situated on the concave aspect of the bowel, adherent to the pancreas and having in its floor a perforation involving the gastro-duodenal artery or one of its branches.

Perforation of the ulcer into the general peritoneal cavity is, with the exception of severe and fatal hæmorrhage, the most serious complication. The ulcer in these cases is usually situated on the anterior part of the first portion of the duodenum, close to the pylorus, and therefore at a place where communication is at once established with the general peritoneal cavity.

This complication may arise as the first symptom of the disease. The patient may be enjoying perfect health when he is suddenly struck down with all the symptoms of acute perforative peritonitis. As in the case of gastric ulcer, perforation may take place at any time, but in some instances it is definitely connected with the distension of the viscus. So far as is known, every case of unoperated-upon perforation into the general peritoneal cavity has proved fatal sooner or later. Death may take place in a few hours or be delayed for a few days.

Rarer complications are such as result from the cicatrisation of the ulcer. Inflammatory thickening around the ulcer has given rise to obliteration of the common bile duct and cystic duct, resulting in death from exhaustion. It is possible also for the hepatic and pancreatic ducts, the portal vein and hepatic artery to be obstructed. Cicatrisation of ulcers near the pylorus will give rise to symptoms similar to those due to obstruction at the pyloric orifice. A still rarer complication is the formation of a fistula.

Treatment.—In cases of simple uncomplicated ulcer the treatment resolves itself into one of careful feeding.



FIG. 33.—PERFORATING ULCER OF DUODENUM.—The ulcer is situated about one inch beyond the pylorus. It is round in shape, and one-third of an inch in diameter. The base is formed of connective tissue. It had not caused symptoms during life. The patient died of heart disease. (*W.I.M., Glas.*)

The diet is limited mostly to milk, and the patient is kept at rest in bed. In cases of hæmorrhage, ergotin should be administered either by mouth or by hypodermic injection. The question of transfusion by normal saline solution should be entertained, and the remarks upon this method of treatment in connection with hæmorrhage from gastric ulcer will be equally applicable here. (See page 135.)

The chief interest to the surgeon, however, concerns the treatment of those cases where perforation has taken place. It is only within comparatively recent years that operative interference has been considered. The success which has attended the surgical treatment of perforation in cases of gastric ulcer is, from the perfect similarity of the two diseases, a sufficient encouragement to hope for like good results in this condition; and, if further encouragement were required, a case has already been recorded where Dean succeeded in excising the ulcer and curing the patient.

It is needless to give here in detail a line of treatment which in all respects resembles that already fully described in cases of perforation of gastric ulcer. The two main points to which the surgeon must direct his attention are the ulcer and the peritoneal extravasation. The ideal treatment of the former will be its removal and the closure of the orifice. Cases will occur where no such complete removal is possible. The surgeon will then have to consider whether he should attempt to close the orifice by the passage of a series of Lembert sutures outside the area of the ulcer, approximating the serous surfaces, and at the same time folding in the ulcer, as under similar circumstances of gastric ulcer; or whether he must be satisfied with thoroughly washing out the region around the ulcer, draining, and stuffing the part with iodoform gauze to prevent further extravasation.

With regard to the peritoneal cavity, it should be freely washed out with warm normal saline solution. The treatment will, however, be the same in all respects to that discussed under Perforated Gastric Ulcer; reference for full particulars may, therefore, be made to that section. (See page 140.)

It may be remarked here with regard to the incision through the parietes, that if the operation is performed

deliberately to deal with the duodenum, the incision should be in the median line above the umbilicus.

The treatment of stricture as the result of a healed ulcer will be dealt with when discussing the subject of stricture itself.

The after treatment of cases of operation for perforative peritonitis is the same as in perforation of a gastric ulcer. (See p. 140.)

Acute ulceration.—In contradistinction to the slowly formed ulcer just described, there is a class of cases where the process is a comparatively rapid one. The patients in whom this form of ulceration is found have usually been the subjects of severe burns, involving, as a rule, a considerable part of the surface of the body. Occasionally, though rarely, it has happened in other affections, as, for instance, in septicæmia. Ever since Curling's memorable paper, a lingering interest has always attached to the subject. Modern experience contrasts strangely with what seems to have occurred in Curling's time. This surgeon was able to collect no fewer than ten cases, which came under his observation within a comparatively few years; while at the present day there are not a few surgeons of large experience in hospital practice who have never met with a single instance. However, cases do crop up occasionally, sufficient to make it certain that there does appear something of the nature of true cause and effect.

Various theories have been promulgated as to the reason of this ulceration. Curling's original suggestion was that the extensive destruction of the skin led to an extra activity of Brünner's glands. The sweat-glands of the skin being destroyed over a large area, an increased activity takes place in the analogous Brünner's glands, and these latter being situated in that part of the duodenum which is most prone to inflammation—that is, the first part—ulceration rapidly ensues.

The most recent contribution to the pathology of the condition is by Hunter,* who attributes the ulceration to the absorption of septic poisons which, being excreted by the bile, have an irritative effect upon the mucous membrane, and so give rise to acute congestion and ulceration.

* *Trans. Path. Soc. Lond.* 1890, vol. xli. p. 105.

These ulcers usually occur in the same part of the bowel as those of the more simple or chronic type. They possess no very marked characteristics; they are usually single, although in some instances two, three, or more are met with. The mucous membrane of the bowel may be congested and inflamed, although the immediate surrounding of the ulcer is sometimes free from inflammation. Their shape and size vary, sometimes round or oval, at other times quite irregular in outline. The margins of the ulcer are frequently sharply cut and undermined. They may cicatrise completely, or progress till perforation takes place, and then communicate either with an artery or with the general peritoneal cavity.

The lesion, if it is to lead to a fatal result, usually does so, according to Curling, some time between the seventh and the seventeenth days. The shortest period in a series of cases collected by Holmes was four days, while the longest was twenty-five.

Children appear to afford the majority of fatal cases; instances, however, of death occurring late in life are recorded.

There appears to be no definite relation between the region of the body burnt and the appearance of ulceration; although in the majority of instances either the abdomen or the chest has been involved.

Symptoms.—In nearly all the recorded cases there have been no symptoms to indicate the lesion in the bowel, until the occurrence of a severe hæmorrhage or of a fatal perforation. It is possible, as Curling suggests, that any symptoms which might otherwise manifest themselves are masked by or attributed to the more gross lesion on the surface of the body, or other general disturbances. A sense of discomfort amounting to pain might be expected to show itself in or to the right of the epigastric region, with some tenderness on palpation of the part. There may be some derangement in gastric digestion. Diarrhœa and vomiting may be present, although these may owe their appearance to other causes. The presence of blood in the vomit or stools will necessarily suggest the probable existence of ulceration; while the sudden onset of acute abdominal pain, with other symptoms of collapse, will leave little doubt that an ulcer has perforated into the abdominal cavity.

Treatment.—It is hardly possible to speak of the treatment of a disease the very presence of which it is frequently so difficult, if not impossible, to determine. When, however, there is reason to suspect the existence of ulceration, the diet should for some time be limited to milk and other mild fluid nourishment. Rest will hardly need to be enforced, for the patient will probably be incapacitated from exercising any movement, by reason of the surface condition of the body. Where possible, Curling suggests the application of leeches over the duodenum; and to allay pain, the administration at intervals of a few grains of grey powder combined with opium. The appearance of hæmorrhage will need to be combated by the usual hæmostatics: the administration of ergotin by the mouth or by subcutaneous injection.

When symptoms of perforation manifest themselves, the usual means now adopted for this complication arising from other conditions should be practised. The treatment does not appear to have been tried; but as the natural course of the complication is inevitably a fatal one, to open the abdomen, search for the perforation, and treat it and the general peritonitis can add no additional danger, but on the contrary may hold out some hope of a cure.

CHAPTER XXIV.

TUMOURS: INNOCENT AND MALIGNANT. STRICTURE. CONGENITAL STENOSIS AND OBLITERATION. PERFORATION FROM EXTERNAL CAUSES. DIVERTICULUM.

Tumours.—Of the two great classes of tumours, innocent and malignant, the latter is the one more commonly met with. Both, however, are extremely rare.

Innocent growths.—A case of fibro-myxoma of the duodenum is reported by Foxwell.* A woman aged 28

* *Lancet*, 1889, vol. i. p. 1239.

years suffered from symptoms akin to those of pyloric stenosis. After death a tumour about three times the size of a chestnut was found at the junction of the second and third parts. Polypi have also been met with springing from some part of the bowel wall.

Malignant tumours.—Primary malignant disease of the duodenum is, according to some statistics collected by Whittier, only met with in one per cent. of all the cases where some part of the small intestine is involved. It may exist in the form of carcinoma or sarcoma. In the former case the disease originates most frequently about the orifice of the bile duct. As it progresses ulceration takes place, and obstruction may be caused either in the bowel or in the bile duct.

The form of carcinoma is most frequently of the cylinder-celled variety.

When sarcoma attacks the duodenum, it as a rule travels round the bowel, so forming a mass which to some extent maintains the shape of the part, but through encroachment upon the interior soon lessens its calibre. The cells of which the growth is composed are usually small and round, and, from the occasional admixture of some few delicate fibrils, assume the character of a lympho-sarcoma. In some instances it appears as if the tumour arose in the submucous tissue, while in others its origin seems more likely to be from the neighbouring lymphatic glands.

Tumours having their origin elsewhere and only secondarily involving the duodenum, must be distinguished from primary affections of the part. Clinically, however, such distinction may not be possible, the secondary implication of the bowel being the primary cause of the most prominent symptoms. Tumour therefore arising in connection with the head of the pancreas will soon seriously implicate the bowel.

Symptoms.—It is not possible as a rule to indicate any symptoms which specifically indicate that they owe their origin to primary disease of the duodenum. The various symptoms which do show themselves are frequently as attributable to disease connected with the stomach, jejunum, or neighbouring parts.

The inevitable result of a growth, either carcinomatous or

sarcomatous, is to produce a gradual diminution in the calibre of the bowel. Symptoms of obstruction, however, may not show themselves until a comparatively late stage of the disease, the reason of this being that the material which passes through the strictured portion is naturally of a somewhat fluid consistency. As soon, however, as obstructive influences come into play, various symptoms arise. Dilatation of the stomach follows, and this may be accompanied by a corresponding dilatation of the part of the duodenum above the obstruction. In one of Whittier's collected cases this dilatation had taken place to such an extent that there was no essential difference in size between the stomach and the first six or eight inches of the duodenum. A further result of increasing obstruction will be various gastric disturbances accompanied with vomiting. The gradually diminishing passage of material through the obstructed part will soon give rise to emaciation, and the patient will suffer from flatulence and colicky pains. External manipulation may indicate the presence of a tumour in the epigastric or right hypochondriac region.

In diseases which attack the region of the biliary orifice—that is, the second or descending part of the duodenum—obstruction to the outflow of bile may take place, with the result that jaundice, distension of the gall bladder, and other symptoms dependent thereon will become manifest. Ulceration may cause hæmorrhage, which will show itself either in the vomit or in the stools. Should the ulceration open up one of the pancreatico-duodenal arteries, a fatal result would ensue. Other causes of death are perforation and general peritonitis, acute intestinal obstruction, and gradual exhaustion, the last being the most frequent cause.

Treatment.—As purely palliative measures, much relief will be obtained by the use of suitable food, and by periodically washing out the stomach. Radical measures can be less entertained than in other portions of the gastro-intestinal canal; only in the most exceptional instances of disease located near the pylorus is it possible to consider the question of extirpation. The deep situation and, above all, the intimate connections of the second and third parts of the duodenum with the pancreas, the blood vessels, and the hepatic ducts, render any such operation almost impractic-

able. It is, however, not unreasonable to assume that temporary relief would be afforded by the performance of gastro-enterostomy. The diversion of the food from the stomach to the jejunum should afford equal, if not greater, relief than in the case of pyloric stenosis for which the operation is usually performed.

Stricture.—Independently of the narrowing of the canal from tumour within or from the pressure of tumours without, there are some cases where true cicatricial stenosis occurs. The comparatively large diameter of the canal, the fluid nature of the material which passes through it, together with the improbability that chronic ulceration ever extends sufficiently far even to produce serious narrowing, all tend to render obstruction from this cause of infrequent occurrence. In all cases cicatricial stenosis owes its origin to previous ulceration; either the result of gall stones or of those causes, whatever they may be, which give rise to the simple or chronic ulcer.

Symptoms.—The symptoms in the main are those of obstruction, but their character differs according to whether the stricture is above or below the orifice of the bile duct. Where the stricture is close to the pylorus, it is not possible to differentiate between this condition and that of pyloric stenosis. As the seat of obstruction, however, recedes from the pylorus, the character of the symptoms changes somewhat. Thus it has been found that after the stomach has been washed out and emptied, the patient would again vomit large quantities of material some few hours afterwards. The reason of this appears to be that a quantity of material lodges in the duodenum at the time of washing out the stomach, but later it is returned and ejected. Some importance may also be attached to the variability which exists in the digestive powers of the gastric juice and in the proportion of free hydrochloric acid present. At one time the gastric secretion may contain free hydrochloric acid and possess active digestive properties, while at another the reverse will be the case. The explanation of this appears to be in the occasional regurgitation of the alkaline juice of the duodenum into the stomach, and so a neutralising of the acid and an interference with the normal digestive properties of the secretion. In stricture situated below the orifice of the bile duct there will be a regurgitation of bile into the

stomach, with interference with digestion, and the presence of bile in the vomit.

Treatment.—It is hardly possible to do more than suggest a line of treatment in a class of cases so rarely met with and still more rarely treated. Either duodenoplasty may be performed or gastro-enterostomy.

Congenital stenosis and obliteration.—Cases now and then crop up where a child lives for three or four days after birth, and then dies with symptoms of obstruction. At the post-mortem, failing the evidence of a stoppage elsewhere, either stricture or a complete obliteration is found in some part of the duodenum. Judging from the very few cases recorded, the condition must be a rare one, and when it is met with the symptoms are not such as to point to the duodenum as the part where the obstruction is seated.

The child at birth may present all the appearances of good health, but on the second or third day it begins to refuse the breast and vomits, bringing up at first, it may be, a little mucus with the contents of the stomach, but later this is mingled with bile if the obstruction be below the orifice of entrance of the duct. In one case it had the appearance of meconium, and in two some blood was present. Meconium may pass *per rectum*. The situation of the constriction or obliteration appears more frequently in the upper part of the bowel. In one recorded instance a complete diaphragm existed just above the entrance of the common bile duct.

The primary cause of these conditions can only be conjectural, but it is probable that those cases in which a certain part of the bowel appears absent, and the ends terminate in cul-de-sacs, owe their origin to some defect in development; while in those in which there is stenosis, it is probable that the constriction owes its origin to the cicatrisation of a simple or chronic ulcer, since such ulceration—as has been already pointed out—is occasionally found in the new-born child.

Diagnosis.—The cases have been too few to form a basis for any diagnostic purposes. Only an approximate diagnosis can be arrived at, and that mostly by exclusion. With symptoms of obstruction, the surgeon should first examine the rectum, digitally and by means of a gum-elastic

catheter; if these fail to find any obstruction, fluid may be injected and note taken of the amount introduced before its return. The passage of meconium in any quantity will probably indicate obstruction high up. When evacuations *per rectum* take place, sweet oil may be given by the mouth, and the motions carefully examined for its presence. Emerson tried this means; oil was administered twice, but nothing appeared in the evacuations. The character of the vomit should be carefully noted; continuous ejections without evidence of bile or meconium will possibly prove one of the best signs that the obstruction is situated in the upper part of the duodenum.

Treatment.—The continuance of the symptoms, with the inability to arrive at a diagnosis, will probably tempt the surgeon to perform an exploratory laparotomy. Not much harm can come of it, nor much good either, except that the surgeon and the friends may have the satisfaction of knowing that life under no circumstances could be maintained.

Perforation of the duodenum from external causes.—The duodenum, like the stomach and other parts of the intestine, may be perforated by inflammatory mischief arising in its immediate neighbourhood.

Diverticulum.—Rare instances of this condition have been recorded. Comparatively recently Lewis S. Pilcher* has drawn attention to the subject in a case that came under his own observation. The pouch was on the point of rupturing at the time of operation.

* *Annals of Surgery*, 1894, vol. xx. p. 63.

CHAPTER XXV.

OPERATIONS.

DUODENOSTOMY. | DUODENOTOMY.
DUODENECTOMY. | DUODENOPLASTY.

Duodenostomy.—The operation of establishing a permanent fistula with the duodenum in cases of obstruction at the pylorus, or of extensive disease in the stomach, has only been performed some few times. Theoretically the opening would appear to be at the best position for feeding the patient, but practically the operation proves much less easy of execution than jejunostomy or gastro-enterostomy, when either of the latter can be adopted as a substitute. The operation has found but little favour with surgeons, and, while fatal in the few instances in which it has been practised, it can hardly be considered to have received a fair trial.

Operation.—The abdomen is opened by an incision in the middle line above the umbilicus. The pylorus is felt for, and the duodenum identified. The latter is then brought up to the wound and secured there by a circle of silk stitches, which pass through the entire thickness of the abdominal parietes, but only through the serous and part of the muscular coats of the bowel. When the stitches are tied, the visceral and parietal serous surfaces should be perfectly coapted. A stitch or two is placed at each extremity of the abdominal wound, so as to close it to the required extent. In the course of a few days the operation is completed by opening the bowel.

The preparation of the patient, the treatment during the period between the first and second operations, and the after treatment are in all respects similar to what is done in the operation of gastrostomy, reference to which should therefore be made. (See page 167.)

Duodenectomy.—The operation of removing portions of the duodenum has up to the present been still more

rarely practised than the operation just described. The most successful instance of its performance is the case already quoted of Dean's, where a duodenal ulcer was excised.

Operation.—The abdomen is opened and the duodenum exposed, as in the operation of duodenostomy. The excision of the part and the closure of the visceral wound will be carried out as in the parallel case of the stomach.

Duodenotomy.—The operation for merely opening the duodenum and then reclosing the aperture exists more in name than in practice. The operation, however, is one that would be employed for the removal of a foreign body, and has indeed been successfully performed for the removal of gall stones lodged near the orifice of the common bile duct.

Duodenoplasty.—The operation in all its details resembles pyloroplasty (see page 190). It is employed for cicatricial stricture of the duodenum. The stricture is divided completely through in the long axis of the bowel, and the raw edges reunited in the transverse axis. It has been successfully performed by Lange.

SECTION II.

THE JEJUNUM AND ILEUM.

CHAPTER XXVI.

ANATOMY AND PHYSIOLOGY.

Anatomy.—The remaining part of the small intestine comprises the jejunum and the ileum, the jejunum forming the upper two-fifths and the ileum the remainder. The two portions run imperceptibly into each other, although at their opposite extremities there are features sufficiently distinctive of each. The average length of the combined parts in the adult is about nineteen feet. Commencing at the termination of the duodenum, on the left side of

the second lumbar vertebra, the bowel forms numerous convolutions, and ends in the cæcum in the right iliac fossa. These coils occupy the middle and lower part of the abdomen, and are surrounded by the large bowel. The jejunum is situated mostly in the umbilical and left iliac regions, while the ileum occupies mostly the umbilical, hypogastric, right iliac, and sometimes the cavity of the pelvis. As broad points of distinction between the two portions, the jejunum is thicker in its coats, larger in calibre, and, from its greater vascularity, deeper in colour.

The mesentery attaches the intestine to the spinal column, the line of connection being from the left side of the second lumbar vertebra obliquely to the right sacro-iliac synchondrosis. At its attachment to the vertebra it measures about six inches, and its breadth between the column and the bowel averages four inches.

Structure.—The wall of the bowel consists of four coats —serous, muscular, submucous, and mucous.

The serous or peritoneal coat completely surrounds the gut, except at its line of reflection to form the mesentery. At this border the vessels, nerves, and lacteals pass to and from the bowel.

The muscular coat is made up of two layers of involuntary muscle—an external and thinner one consisting of longitudinal fibres, and an internal and thicker composed of circular fibres. The submucous coat consists of loose cellular tissue, connecting together the mucous and muscular coats, and serving as a support for the blood-vessels prior to their final distribution, and for the larger lacteal spaces at the bases of the villi and solitary glands.

The mucous membrane which lines the bowel is very loosely attached by means of the lax submucous coat beneath, and is thrown into numerous folds and projections, the valvulæ conniventes and villi. The surface of the mucous membrane is covered by a single layer of columnar-shaped epithelial cells, which is uniform throughout its distribution.

The following are the structures contained within or forming part of the mucous membrane, and constituting the special features of this portion of the small intestine:

Valvulæ conniventes.—These are reduplications of the mucous membrane. They extend throughout the jejunum, but begin to disappear towards the middle of the ileum.

Where most typically represented, they extend round the bowel for nearly two-thirds of its circumference, and are about one-third of an inch in breadth. Their functions are to retard the passage of the chyme and to increase the absorptive surface of the bowel.

Villi.—These are minute vascular projections which extend throughout the entire length of the jejunum and ileum, becoming less marked, however, as the end of the latter is approached, and being more or less absent from the surface of Peyer's patches. Their intimate structure must be studied elsewhere, but it may be briefly indicated that they contain an intricate network of blood vessels, with a large lacteal running down the centre. Their chief function is concerned in the process of absorption.

Simple follicles, or crypts of Lieberkühn.—These are minute tubular glands disposed perpendicularly to the surface of the mucous membrane. They exist throughout the entire length of the intestine, and are situated between the villi, and only around and not upon Peyer's patches.

Brünner's glands.—Only a few of these glands are found at the commencement of the jejunum, their principal seat being in the duodenum. They are located in the submucous coat, and their ducts open upon the surface of the mucous membrane. They secrete a material which, as a component of the succus entericus, takes some part in the process of digestion.

Solitary glands.—These are found throughout the small intestine, and consist of lymph follicles composed of a dense retiform tissue containing numerous lymph corpuscles.

Peyer's patches consist of collections of solitary glands which form circular or oval patches varying in length from half an inch to four inches. They are found mostly in the lower part of the ileum, are most common in early life, and often disappear in old age. They are usually free from villi upon the surface, and are surrounded at their margins with Lieberkühn's glands.

Vascular supply.—The arteries which supply the small intestine are derived from the superior mesenteric. Appearing at the lower border of the pancreas, the trunk of the vessel passes between the two layers of the mesentery. Here it divides into numerous branches which uniting together form a series of loops with their convexities turned

towards the bowel. From these loops other vessels are given off, which uniting together form another series of arches, a process of distribution which is repeated some three or four times. As the border of the bowel is reached the terminal branches take a straight direction, passing round the bowel and anastomosing with each other. The veins have a similar course to that of the arteries. The main trunk joins with the splenic vein to form the portal.

Lymphatic or lacteal system.—The radicles of the lymphatics or lacteals commence in the villi and the lymph spaces around the solitary glands They unite together at the mesenteric attachment and pass to the mesenteric glands, whence they proceed to form two or three large trunks which enter the thoracic duct.

Nerve supply.—The small intestine is supplied through the sympathetic nervous system, and through that particular portion of it which forms a plexus surrounding the artery of the same name, the superior mesenteric. This plexus is a continuation of the solar plexus, and is therefore placed in connection with the greater splanchnic and the right vagus, all of which are intimately associated with the semilunar ganglia.

Physiology.—With the intricate process of digestion carried on in the jejunum and ileum there is no need to deal. The contents of the stomach as they leave that organ do so in the form of a thin pultaceous chyme, semi-fluid in consistence, and acid in reaction. This acidity gradually diminishes as the chyme becomes mixed with the alkaline secretions of the liver, pancreas, and intestinal glands until about the middle of the ileum, where the whole contents of the gut is alkaline in reaction, and remains so until it reaches the ileo-cæcal valve.

At the lower end of the ileum the contents of the bowel assume a light yellow colour and possess a markedly fæcal odour.

The propulsion of the chyme through the bowel is effected by the peristaltic or vermicular action of the muscular coat. The contraction may be limited to sections only of the canal; it is produced by the contents of the intestine exciting a reflex action through the intestinal ganglia. Other stimuli are conveyed through the right vagus and greater splanchnic nerves.

CHAPTER XXVII.

INJURIES. CONTUSION: ACUTE AND CHRONIC ENTERITIS, ULCERATION AND SLOUGHING, STRICTURE. RUPTURE.

Contusion.—Any severe blow upon the abdomen may cause bruising of the bowel, and the injury inflicted is greater or less according to the force of impact, the nature and shape of the agent producing the injury, and the condition of the bowels at the time. The kick of a horse upon a loaded intestine would cause a much severer contusion than a blow by a fist upon an empty bowel.

A contusion in its simplest form merely consists of a congestion of the walls of the bowel, with rupture of some capillary blood vessels—a condition resembling in all respects a bruise of any soft part. In its severest form it leads to sloughing and gangrene of the injured part. Between these two extremes certain inflammatory changes may take place. If acute inflammation set in, the symptoms of acute enteritis arise; and if the inflammatory process proceeds more slowly, evidences of chronic enteritis become manifest.

Symptoms.—No special symptoms can be said to point to contusion pure and simple. The pain and collapse from which the patient may suffer may as likely indicate a rupture of the bowel as it may an uncomplicated contusion of the abdominal wall. It is only in the progress of the case that some clue may be obtained as to the true nature of the injury. Frequent dark fluid offensive evacuations, indicative of the presence of blood, are symptoms of much significance. As will be pointed out in the case of rupture, contusion may be unaccompanied by any external manifestation of injury to the abdominal parietes.

Acute enteritis.—The appearance of traumatic enteritis will be known by the onset of symptoms peculiar to that condition when arising from other causes, and for which a fuller description should be sought in books on medicine. The appearance of such symptoms as offensiveness of the

breath, furring and dryness of the tongue, aching and griping, nausea and vomiting, diarrhœa, and the usual attendants of fever should suggest to the surgeon the possible nature of the affection.

Chronic enteritis.—Here also the symptoms significant of this condition are more frequently met with by the physician when arising from other causes; medical works therefore, should be consulted. The surgeon may reasonably suspect the existence of such a condition when the patient begins to suffer some days or weeks after the accident from offensive evacuations, with excessive secretion of watery mucus, griping pains, and gradual emaciation from imperfect intestinal digestion and absorption. In less marked instances it is sometimes difficult to distinguish between such a condition and some local chronic peritonitis.

Prolonged chronic inflammation may lead to cicatricial stricture, and this to the symptoms of a gradually increasing obstruction.

Ulceration and sloughing.—A blow which at the time is sufficient to devitalise a part of the bowel, will sooner or later be followed by separation of the part. As this sequel to a blow only results from a severe injury, it is not infrequently found in association with rupture. One part of the bowel may be torn, while another will be badly contused, and it is often a matter of considerable difficulty for the surgeon to determine whether or not the contused portion should be left to itself, or as efficiently dealt with as the ruptured part. So many cases have now been reported where serious and fatal symptoms have come on some days after the injury and been found to be due to a perforation through a gangrenous patch of bowel, that it behoves the surgeon to look for and consider well the propriety of treating efficiently any badly bruised part.

The consequences of ulceration and sloughing of the bowel may be conveniently considered under four heads.

First, where the bruised bowel becomes adherent to the abdominal parietes, it and the latter giving way, a fæcal fistula is formed. The complication is a rare one, because it so seldom happens that the abdominal parietes are sufficiently seriously injured to give way, by subsequent sloughing. In most instances, a blow severe enough to

devitalise a part of the abdominal wall would almost certainly rupture the gut.

Secondly, where the injured bowel becomes adherent to the abdominal parietes, the latter remaining intact, an abscess may form at the seat of contusion, and either burst externally, leaving a fæcal fistula, or empty itself in the bowel.

Thirdly, where no such adhesion to the parietes takes place, the separation of the slough leads to a communication with the general peritoneal cavity, and acute fatal peritonitis follows.

By far the largest number of cases come under this head. The usual history of the case is that after the patient has recovered from the shock, the immediate result of the injury, recovery apparently takes place. The pain gradually becomes less, vomiting ceases, and the bowels move, and just when hopes are entertained that all danger is past, the patient is suddenly struck down with all the symptoms of acute perforative peritonitis. The time at which such perforation takes place varies. It usually occurs between the fourth and the tenth day.

Fourthly, cases where portions of the bowel are cast off and passed *per rectum*. It is difficult to understand how this process of separation has been effected, except on the assumption that the injured part must some time subsequently have become intussuscepted; and the explanation becomes the more probable when it is noted that in each instance of the cases recorded it was a complete segment of the bowel that passed, measuring not less than ten inches.

Treatment.—Contusions of the abdomen giving rise to serious symptoms immediately after the receipt of injury, should all receive, at first, the same treatment. Rest, and nothing by the mouth, should be the rigid rule of practice. If the collapse be so profound that stimulants appear imperatively necessary, these should take the form of brandy by the rectum or ether subcutaneously. As the primary collapse passes off, the question of laparotomy will arise. If the indication is in the direction of a gradual subsidence of the acute symptoms, then active measures may be delayed, and the patient's strength maintained by the administration of nutrient enemata. Nothing, not even ice, should be given by the mouth, as everything taken into the stomach

is liable to excite peristalsis of the bowel. This method of treatment must be carried out as long as possible, as long indeed as the patient's strength appears likely to allow. To obtain rest more effectually for the bowel, opium should be added to the nutrient enemata.

In the event of laparatomy being performed, the greatest difficulty may arise in determining whether or not the injured part should be excised. Experience would seem to teach that when in doubt it would be wiser to remove the part than leave it. As already shown, the commonest result of sloughing or gangrene of the bowel is fatal perforative peritonitis. If in any case the injury has been severe enough to rupture the bowel in one part, it is the more likely that a contusion found elsewhere will subsequently perforate. Hence in these particular instances the conditions may be deemed of a more critical nature than in those of uncomplicated bruising.

The after treatment of cases operated upon must be on the same strict lines of perfect rest. So long as the patient can live by rectal alimentation, nothing should be administered by the mouth.

Rupture.—The same causes which produce contusion of the bowel may give rise to rupture. The force of the injury, and the nature of the body producing it, are the principal factors in determining the occurrence of rupture in place of contusion. Where in any case, therefore, the blow has been sufficient to knock the patient down, or dislodge him for some feet: where a fall has been from some height: where the wheel of a heavy or heavily laden vehicle has passed across the abdomen; or where a very tight squeeze or jam has occurred, suspicions should be entertained, however slight perchance may be the symptoms, that some injury graver than that of contusion has taken place. As has already been pointed out in the case of contusion, so here does it apply with equal, if not greater force, that the condition of the bowel at the time of the accident materially affects the nature and extent of the injury, a loaded intestine being more likely to be ruptured than an empty one, and the lesion itself graver

The nature of the lesion produced in any case may vary in regard to extent, from the size of a small puncture through which the intestinal contents will not exude, to a

complete breach of continuity. The bowel may be ruptured at the point of impact, or at some distance from it. In the former instance there is likely to be considerable contusion of the margins of the rent, which may be jagged and irregular, or more or less of the nature of an incision. In the latter, while the tear may be clean cut or irregular, the margins of the aperture are usually free from bruising. In both cases there is the possibility of some rent in the mesentery, a lesion the existence of which is usually indicated by the presence of considerable intra-abdominal hæmorrhage.

Regarding the relative frequency with which the two parts of the small intestine are involved, it would appear that the ileum is somewhat more frequently ruptured than the jejunum. There is nothing to show that the ileum is more frequently injured in one part than another, but in the case of the jejunum it is the upper part or that nearest its commencement that most frequently suffers. The left hypochondriac region, then, is always a part to be carefully explored.

Symptoms.—The immediate result of the injury is to produce more or less shock. The degree of the shock produced is frequently, however, no indication of the severity of the lesion. So far indeed does this appear from being in any sense a symptom peculiar to rupture, that it seems reasonable to believe that it is in some instances the result rather of a powerful emotional effect produced by the consciousness of a severe injury than of any special lesion acting in any particular way. On the other hand not a few cases are recorded where grave lesions have occurred, but there has been an entire absence of shock.

Pain is almost always present, although it may vary considerably in severity and situation. If masked at first by shock, it usually supervenes later, when it may be of a most acute character, causing the patient to "double up." Pain, when thus acutely felt either immediately after the injury or as the primary shock passes off, is aggravated by movement, respiration, and physical examination. It is most often complained of immediately over the seat of the rupture; at other times it radiates over the whole abdomen, and when thus diffused it fails to afford any clue as to the probable situation of the lesion. To secure immobility the

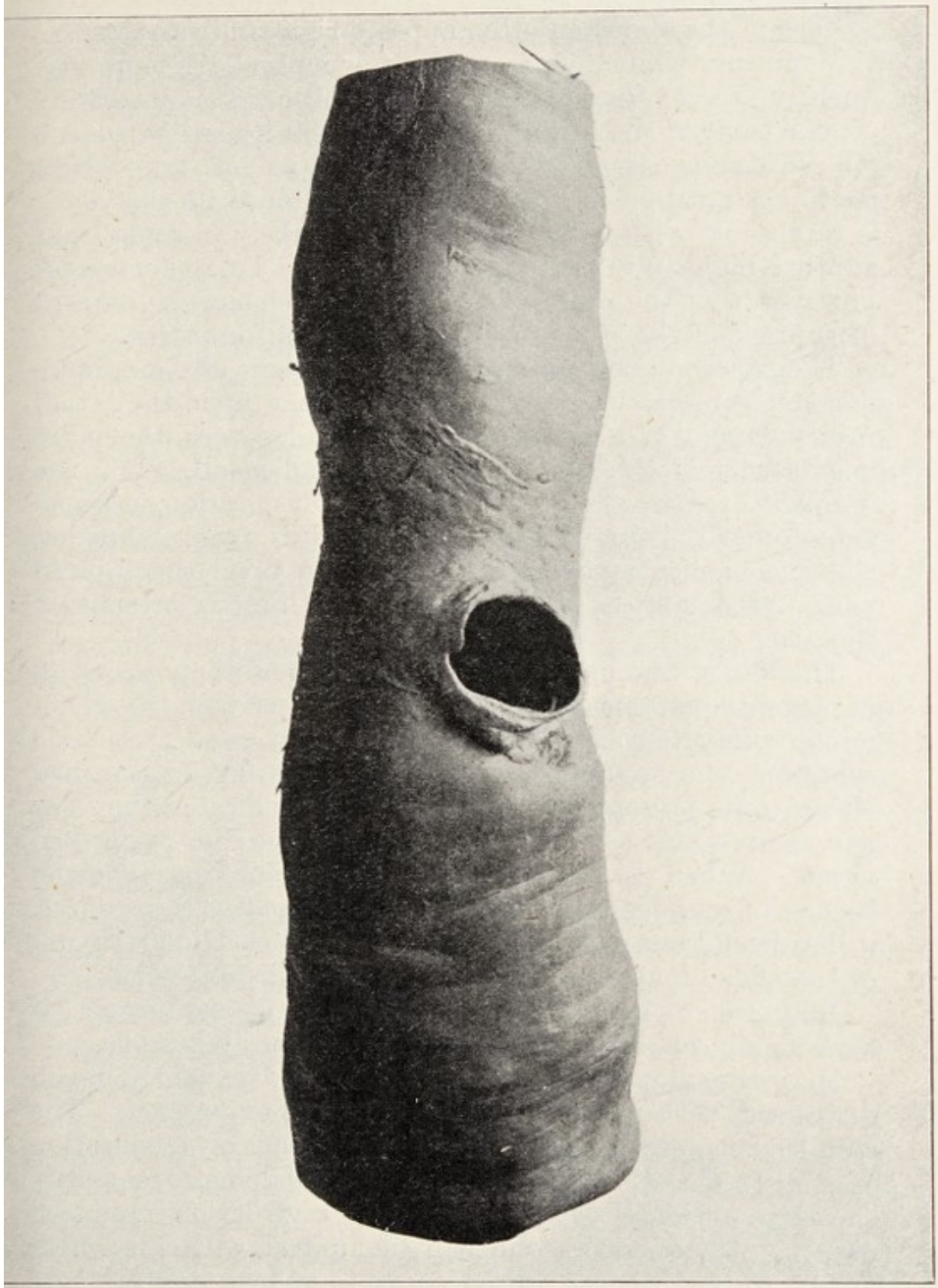


FIG. 34.—RUPTURE OF JEJUNUM.—The rupture was seated about twenty inches from the duodenum, and was the result of a fall across a bar. (*W.I.M., Glas.*)

parietal muscles are thrown into contraction, so that the surface of the abdomen often appears rigid and retracted.

Vomiting, while not a constant symptom, is more frequently present than absent, and often occurs immediately after receipt of the injury. When present it usually persists and, in those cases in which recovery does not take place, continues until death. The presence of blood in the vomit is rarely met with; when present, it is likely to come from rupture high up in the jejunum. It must be remembered, however, that the presence of blood is much more significant of rupture of the stomach than of the small intestine.

The state of the pulse and the temperature are more dependent upon the amount of shock than upon the actual injury done. When the former is at all severe, the pulse may become feeble, quick, irregular, and small, while the temperature may sink below normal. Respiration is sometimes quick, laboured, and shallow. It is painful because the movements involved are apt to act upon the injured parts. It is noticed therefore that breathing is principally thoracic.

The loss of the usual area of liver dulness may prove an important symptom of rupture of some part of the abdominal alimentary canal. It is however, not a reliable symptom, and too much importance must not be attached either to its presence or its absence. It indicates that gas has escaped and probably is escaping from the perforated viscus. When gas exists to any large extent, the abdomen becomes distended and tympanitic; in exceptional instances, it has been known to make its way into the cellular tissues of the abdominal parietes and other more distant parts.

Retention of urine, while a symptom of no significance, is occasionally present. Defæcation sometimes takes place.

In general appearance the patient is frequently much distressed, with pallor of face and anxious expression. The skin surface may be pale and cold, with beads of perspiration on the forehead. The skin over the abdomen frequently shows no evidence whatever of the grave lesion produced deeply. If not restless, he will lie in bed with his knees drawn up and thorax raised so as to relieve any pressure upon the abdominal contents. Great thirst is frequently complained of.

As the primary shock passes off and the patient becomes

more conscious, symptoms of acute general peritonitis begin to appear in from twelve to twenty-four hours from the time of receipt of the injury.

Prognosis.—With but very few exceptions a ruptured bowel which is left unoperated upon leads sooner or later to a fatal result. Injuries to the jejunum do not seem more rapidly fatal than those to the ileum. The remote possibilities of a natural cure depend either upon adhesions forming between the rupture and some neighbouring part, or the formation of a localised abscess, which, bursting externally, produces a fæcal fistula. In cases operated upon, the chances of success largely depend upon the time which has elapsed between the injury and the operation. Where this is short, and before the progress to any marked extent of general peritonitis, a reasonable hope of recovery may be entertained.

Treatment.—Recognising the almost uniformly fatal termination of these cases when left to the unaided efforts of nature, exploratory laparotomy should be performed as soon as the patient has sufficiently recovered from the primary shock.

During the early period the patient should be kept at rest in bed, warmth applied to the body generally, and hot fomentations to the surface of the abdomen. If stimulants are deemed necessary brandy should be given by the rectum, or ether by subcutaneous injection. Nothing should be administered by the mouth.

In performing the operation, the abdominal incision should be made in the median line above the umbilicus. This admits of examination of the stomach and duodenum, as well as of the upper part of the jejunum. If necessary for a more complete examination or for easier and more efficient treatment of the rupture, the incision may be enlarged downwards or laterally.

On opening the peritoneal cavity, the escape of gas or fæcal matter will confirm the diagnosis. A systematic and careful search for the rupture should then be made. A loop of intestine being withdrawn from the abdominal cavity and held by an assistant, one end is traced until it leads to its fixed extremity, which may either prove to be the duodenal above or the cæcal below. This portion of the bowel, as it is drawn out through the parietal wound,

should be carefully protected by the assistant with warm cloths, and as soon as its examination is completed it should be carefully replaced before a similar process is gone through with the other end of the loop.

When the rupture has been found, the surgeon has to decide what method he will adopt in treating it, whether he will elect to (1) stitch it up, (2) resect it, or (3) attach it to the parietal wound, and so form a fæcal fistula or an artificial anus.

(1) Stitching up the wound should only be adopted when the rupture is small or of the nature of an incision with non-contused edges. A series of interrupted Lembert sutures should be inserted. The true guidance for the employment of this method is when the application of sutures can be effected without seriously narrowing the calibre of the canal.

(2) Excision, with reunion of the divided extremities, or some form of lateral anastomosis must be considered when the simple method above described cannot be carried out. In other words it should be adopted when the wound is large, or its edges so contused that sloughing or gangrene is probable. By this method of enterectomy and circular suture successful results have been obtained.

(3) The formation of an artificial anus is the wiser course to adopt when portions of the bowel distal to and distant from the seat of rupture are sufficiently badly contused to render it advisable to give the parts complete rest. The temporary diversion of the fæces through the artificial aperture gives greater chance of repair to the contused parts, and lessens therefore the risk of subsequent perforation.

The finding of a single rupture should not satisfy the surgeon that that is the sole lesion present; the possibility of a second elsewhere must be remembered, and also the existence of badly contused areas. Further, the mesentery and omentum should always be carefully looked to; especially should this be done when there is evidence of intra-abdominal hæmorrhage. It is usually from some torn vessel either in the mesentery or omentum that bleeding most freely takes place. In addition to the injury to the bowel and its attachments, it is necessary to remember the possibility of grave lesions of the neighbouring viscera.

When the rupture or any other lesion has been dealt with, the peritoneal cavity must be thoroughly cleansed either by swabbing or by washing out. This needs to be all the more efficiently done if peritonitis has commenced or fæcal extravasation has been marked. As accumulations of fæcal or inflammatory material are more liable to take place in the pelvis, the tube should lead well down into that cavity; and where this cannot be effectually done from the wound above the umbilicus, the incision should be extended downwards or a second one made below.

It has happened that while there has been distinct evidence of rupture, from the extravasation of foreign material into the abdominal cavity, the lesion could not be found.

The treatment after operation for rupture is that carried out in all similar instances of intra-abdominal operation, rest and rectal alimentation being the primary requisites.

CHAPTER XXVIII.

INJURIES (*continued*). PUNCTURED AND INCISED WOUNDS.

While wounds of this nature are usually severer in their effects upon the jejunum and the ileum than upon the large bowel, the difference in other respects is hardly sufficient to necessitate a separate discussion of each region. It is proposed therefore to treat them together, noting such points of distinction in the pathology, symptoms, and treatment of each as may seem necessary.

From a purely clinical aspect, punctured or incised wounds of the bowel practically resolve themselves into what is more broadly comprised in similar wounds of the abdomen. A patient who has received a punctured wound in this region may present symptoms which in no way indicate whether (1) the parietes have only been incompletely penetrated or whether (2) there has been complete perforation, or whether

(3) such perforation has injured the bowel only slightly or (4) severely.

It has been a fruitful source of discussion in more recent times to determine what attitude the surgeon should adopt in those cases where the symptoms are not sufficient to indicate the true nature and extent of the lesion. This is a matter, however, which will be dealt with when considering the question of treatment.

Nature of lesion produced.—1. *The injury to the parietes.*—The shape and extent of the wound in the abdominal wall will depend upon the nature of the agent causing the injury, the force with which it acted, and the direction and distance from which it came; or, in the case of stationary objects, the distance from which the individual had fallen. In but few cases is there liable to be much gaping of the parts, and therefore without the hernial protrusion of the bowel or the escape of its contents, it may often prove difficult, if not impossible, to decide from external appearances whether or not the wall has been completely perforated.

We have, however, here to deal only with actual instances of complete perforation. A deliberate stab with a knife may produce an incision no longer than the breadth of the blade; but if this be plunged in or withdrawn obliquely, a much larger wound would be produced. The lesion caused by a small, round, sharp-pointed body, such for instance as a stiletto, does not as a rule inflict an injury of any magnitude; indeed, the contraction of the strong abdominal muscles around the narrow channel of penetration reduces it to such an extent that these frequently prove the most deceptive cases.

The nature of the agent, and the circumstances under which it existed or was used, should be well considered in framing any opinion as to the possible extent of the lesion, however opposed in other respects might be the suggestions conveyed by the external appearances of the wound. Blunt-pointed bodies, such as spikes of palings, stakes, &c., which pierce the abdomen in cases of falls from a height, produce lacerated and contused perforations.

2. *Injuries to the bowel.*—Whatever the nature of the agent inflicting the injury, the extent of the lesion will be considerably affected by the state of the bowel at the time.

If distended, it is more likely to be gravely involved than in the opposite condition.

The bowel, like the parietes, may be incised, punctured, or more or less torn according to the nature of the agent producing the wound. In the case of incised wounds, the resulting aperture varies according to the direction of the incision; when this is longitudinal or parallel to the axis of the bowel, a larger opening will probably take place than if the cut has been a transverse one. The circular muscle of the intestinal coat appears to have a more powerful effect in causing the wound to gape than the longitudinal. There is, therefore, a greater liability of escape of the bowel contents in the one case than in the other. In small punctured wounds the contraction of the surrounding muscle fibres may almost obliterate the aperture. In many instances there is prolapse of the lax mucous membrane, so that it forms a hernial protrusion through the aperture, the result of which is to establish a fistulous communication with the general peritoneal cavity. Multiple lesions are always possible; either the same part may be transfixed, presenting, therefore, two opposite orifices, or two or more independent coils may be similarly injured.

The escape of fæcal material is more liable to happen in wounds of the small than of the large intestine, because of the more liquid condition of the contents of the former. Leakage will naturally be more probable in cases of a full than of an empty bowel.

Symptoms.—As already indicated, the difficulties connected with determining whether in any given case the bowel has been injured are often very great. It might almost with truth be said that unless gas or fæcal material exudes from the abdominal wound or from a prolapsed portion of bowel, there are no other symptoms at the time of the injury, or very shortly after it, which would lead to the certain diagnosis of injured intestine.

Shock is most variable, indicating on the one hand, as it may, a purely emotional effect where no gross lesion exists, and on the other an injury so severe that a fatal result must almost inevitably accrue. Where shock is not sufficient to mask other symptoms, the immediate result of the injury may be to cause acute abdominal pain, followed by vomiting and possibly some movement of the bowels. Blood

may be passed *per rectum*, but this, when it occurs, is usually some little time after. One of the most reliable symptoms, and one which by some is considered almost pathognomonic, is tympanites. Its presence therefore at an early period should excite the gravest fears that the bowel has been opened.

When later symptoms develop, they will usually be those indicative of peritonitis, arising, if not directly from the traumatism, indirectly from the extravasation or escape of fæcal material into the peritoneal cavity. In some instances the symptoms at the outset are so slight that it is reasonably doubted whether any grave lesion can have been inflicted, yet in the course of a few days the patient is suddenly struck down with what soon proves to be acute general peritonitis. The explanation of this is the giving way of certain adhesions which, for the short time being, had been sufficient to prevent leakage at an earlier period.

In cases of much loss of blood, the increasing pallor of the face and the weak, compressible pulse soon indicate the nature of the injury. Either blood has escaped or is escaping from the wounded surface of the bowel, or it is coming from a severed mesenteric vessel. When the quantity of blood lost is large, it is more commonly from the latter source.

Prognosis.—With often so little definite knowledge gained from the symptoms as to what is the true nature of the lesion, an opinion at the outset regarding the future issue of any case becomes impossible. If, however, we reason on certain definite assumptions, we can then frame a prognosis; for ample experience is forthcoming to show what is liable to happen in any case where no surgical measures are adopted.

In the first place, then, if fæces or gas escape from the parietal wound, one of two things must happen: either the patient will shortly die of peritonitis, or adhesions will form between the visceral and parietal apertures, and a fæcal fistula result. The probabilities are all in favour of the former.

Where, again, the bowel has been opened in a distended condition, extravasation will almost certainly occur, resulting in fatal peritonitis. On the other hand, incision or puncture

of collapsed intestine may result in the rapid formation of adhesions which, in thus occluding the orifice, will effectually form a barrier to the escape of foreign material. An injury to the large bowel in a collapsed condition is still more likely not to be followed by any leakage than in the case of the small.

It need hardly be pointed out that the nature of the agent producing the injury must materially affect the prognosis; for the larger the wound inflicted, the greater the probability that untoward conditions must arise. However slight, therefore, the symptoms at the time of the injury, a graver prognosis needs to be formed where the agent has been a sword or a broad-bladed knife than where it has been of the nature of a small, narrow, sharp-pointed body.

There is much to show from recorded cases that operation performed before the onset of peritonitis may prove successful.

Treatment.—Enough has been said in discussing the symptoms and prognosis of these wounds to show how difficult must be the question of treatment. To know that nature is capable of executing repair and not to know in what particular instances she can do so, sums up the sole difficulty in which the surgeon finds himself. It would be comparatively easy to say what should be the treatment if the lesion was precisely known. But in the large majority of instances we know at the outset little more than that the abdominal wall has been either partially or completely penetrated. Discussing therefore the treatment from the clinical standpoint, the first question which always presents itself is, are we to stand by and wait to see what nature will do, acting, for the time being, on the broad principles of rest; or are we to probe the matter to the bottom, and satisfy ourselves what is the nature of the lesion, if such there be? To have suggested, much less to have adopted, the latter course some years ago, would have been deemed meddlesome, if not actually bad, surgery. But is this likely to be the opinion of modern surgeons? I cannot venture, on the basis of my own limited experience of these cases, to offer any opinion; but if the practice and teaching of those surgeons whose experiences have been amply sufficient to warrant the foundation of a definite practice, may be accepted, then it would appear that the right course to adopt

is not to leave the issue to the vague and uncertain possibilities of nature, but actively to interfere.

It may then be considered that the proper practice to adopt, in all cases of perforating abdominal wound, is to probe the wound, ascertain its direction and extent, and, if found to perforate the parietes, to proceed at once to open the abdomen and explore its contents. Where there is any difficulty in passing the probe, but, nevertheless, the symptoms render it probable that complete perforation has taken place, an exploratory laparotomy should be performed.

What treatment the bowel should receive will naturally depend upon the nature and extent of the lesion. A simple incision of limited extent, or a perforating wound, will need little more than careful stitching with Lembert sutures. Complete section of the canal must be treated by circular suture, or by one of the numerous methods now in use for intestinal anastomosis. It may be considered proper to stitch the bowel to the parietal wound, and so form for the time being a fæcal fistula or an artificial anus, which can be subsequently dealt with. A careful investigation of the whole length of the canal should always be made, as multiple lesions are not infrequent. As soon as the surgeon has satisfied himself that all lesions have been efficiently dealt with, whether they are only of the bowel or of the mesentery also, the peritoneal cavity should be thoroughly irrigated with warm normal saline solution. This should be all the more radically carried out when there has been distinct evidence of extravasation; or, without such evidence, when the wound in the bowel has been sufficiently large to render it probable that some leakage has taken place.

CHAPTER XXIX.

INJURIES (*continued*). GUN- AND PISTOL-SHOT WOUNDS.

Wounds of this kind fall more under the domain of military than civil surgeons, but they are sufficiently frequent in

the practice of the latter to warrant, if not a detailed description of the symptoms and lesions, at least a careful consideration of the question of treatment. In civil practice the wounds met with are mostly those inflicted with revolvers and fowling-pieces; in the former case the weapon is used, as a rule, at close quarters and with homicidal intent; while in the latter the wound is mostly the result of accident, and varies in severity according to the range.

Symptoms.—Quite as much difficulty exists in determining the nature of a pistol- or gun-shot wound as in the case of incised wounds. Not only does shock form a most variable concomitant, but the gravity of the lesion itself may bear no ratio to the more strictly local signs. In the majority of instances, however, there will be both local and constitutional evidences of perforation; and it must be taken as exceptional where one or two signs at least do not stand out prominently.

Tremaine,* as the result of a somewhat extensive experience in wounds of this class, in both military and civil practice, states that he has been led to the following conclusions: "That the calibre of the ball, the proximity of the weapon, and the position of the wounds of entrance and exit have an important bearing: That, as regards general symptoms, the existence of prolonged shock, a lowered temperature, a feeble pulse, great restlessness, marked anxiety of countenance, accompanied by tympanites and great pain, taken in connection with the anatomical location of the wound, afford very strong evidence of a perforating wound of the intestines: That the escape of blood from the anus rarely happens soon after the injury, and is consequently of little value as a diagnostic sign."

As exceptional instances, where either the severity or the mildness of the symptoms is liable to mislead, may be mentioned first a case where the patient was apparently moribund from severe shock, although there was no perforation; and, secondly, a case where there were several perforations but no serious symptoms. In the former case the bullet had only perforated the clothes in which it was found, the skin being quite intact; in the latter it had perforated the small intestine in two places, and the large in one.

* *Philadelphia Medical News*, 1886, vol. xlix. p. 601.

Nature of the lesion.—It may be roughly said that the lesion produced by shot or balls of different calibre vary only in the size of the aperture; in all respects it is a lacerated wound, with a certain amount of destruction of tissue along the track taken by the projectile. The size of the aperture, however, creates a serious difference; for while a small one may become completely occluded by the contraction of the muscles surrounding the channel, a large one will, as regards both parietes and bowel, admit of the escape of fæces.

The course of the bullet in the abdominal wall is often difficult to trace. It may have completely perforated the parietes, and a dark-stained aperture of entrance may be seen, but the passage of a probe along the track may be quite impossible. This difficulty may arise from one of two causes—either the unequal contraction of the powerful parietal muscles so alters the direct continuity of the canal that it is practically rendered impermeable, or, from a want of knowledge as to the course taken by the bullet, the surgeon fails to strike the track. The point is of considerable practical importance to remember, because the failure in any endeavour to pass an instrument along the track of the ball should not mislead the surgeon into the belief that no perforation has taken place.

To what extent a ball may be deflected by the soft parts through which it passes it is not possible to say. It is held by many that such deflection does not take place, while, on the other hand, it is maintained that the track is always a perfectly straight one. However this may be, one fact appears certain: that the coil of bowel most injured is that lying immediately behind or opposite the track in the abdominal parietes.

Prognosis.—It may always be said that the smaller the projectile the more favourable will be the prognosis; hence a wound produced by pellets will be comparatively less serious than one produced by a pistol ball. A charge of shot fired at close quarters will produce a much graver injury than after the charge has spread.

In cases where no operation is performed by far the larger number end fatally from acute general peritonitis. Such cases as recover for a short time, or completely, do so from the formation of adhesions. These may serve to

occlude the lacerated orifices until the slough separates and is carried away with the fæces, or they may form the boundaries of a localised peritonitis which ends in the production of an abscess. In the latter case the abscess may burst into the bowel, the most favourable course; or externally, with the possible sequel of a fæcal fistula; or into the peritoneal cavity, with the fatal result of acute suppurative peritonitis.

In cases which have been operated upon, that is to say, in which laparotomy has been performed, the chance of a

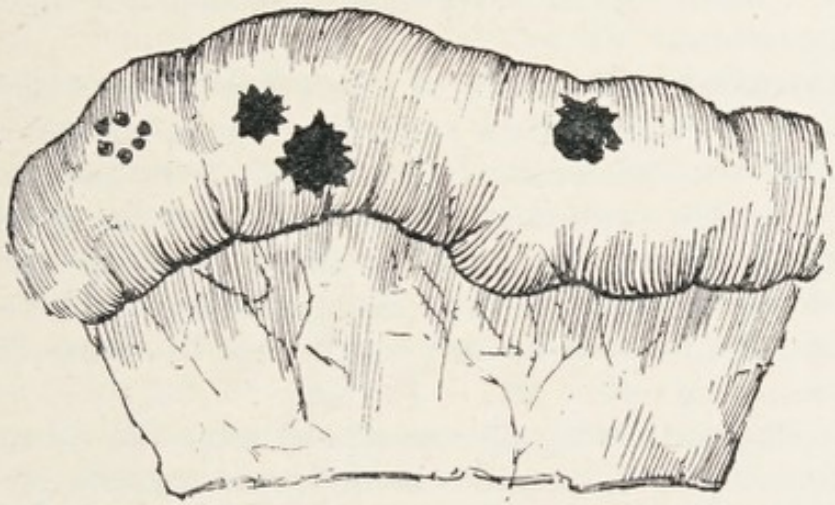


FIG. 35.—Pistol-shot wound of small intestine. (Bull.)

successful result much depends upon the time which has elapsed between the receipt of the injury and the operation. If performed within six hours, the prospects are much more favourable than at any time after that; for in cases of extravasation peritonitis will have commenced, and this always adds a serious factor to the existing lesion.

Statistics do not afford any very safe means for determining the value of operation; for, as seen, so much depends upon the size of the projectile, the range at which it was fired, and the period of time elapsing before operation. Numerous cases of recovery are recorded where it appears certain that but for the operation a fatal result must have ensued.

As regards the ultimate lodgment of the bullet, if it does not pass right through the body, as it rarely does, it may find a final resting-place in the soft parts of the parietes

opposite the seat of entrance; or, if it becomes spent before completely traversing the abdominal cavity, it may simply pass into the bowel or fall into some dependent part of the peritoneal cavity. We know now that we need no longer remain in doubt as to the existence or not of a bullet; by means of the Roentgen rays we can definitely prove its presence and locate its position, though we may not be able to state in what particular tissue or organ it is lodged.

It must be remembered that balls, especially the larger ones, are liable to carry into their track particles of clothing which, from their naturally septic character, are likely to produce inflammation independent of any due to the perforating lesion.

Treatment.—No class of cases has given rise to more discussion in recent years regarding the question of treatment than that under consideration, and the points at issue may be briefly summed up in the simple question of whether laparotomy should or should not be performed, or, in other words, whether the patient should be left to the unaided efforts of nature or whether the surgeon should intervene.

From the conflicting opinions held some few years ago, it would have been impossible to deduce a method of practice which had sufficient weight to enforce it as the only correct one to adopt. If we go far enough back we find a distinct feeling in favour of non-interference. But in the most recently expressed views there is a clear and decided leaning towards active intervention. The success which has attended operations in cases where death was otherwise inevitable, as well as the now incontestable safety of carefully and properly performed laparotomy, have largely tended to clear the way for a definite line of treatment. If a bowel has been badly perforated, operation alone can save life; if on the other hand the perforation has been small and capable of natural repair, a carefully performed laparotomy should neither hinder the reparative process nor cause any additional danger.

Assuming therefore that laparotomy is a perfectly proper operation to employ, are there any special indications against its adoption in any particular case?

As has already been pointed out, the diagnostic value of probing a wound is practically small, for in a case of com-

plete perforation it may be just as likely impossible as possible to pass it along the track of the bullet.

If, then, there is distinct evidence of a wound of entrance, that may, for all practical purposes, be deemed sufficient reason for entering upon other considerations regarding the question of laparotomy. The most important of these is the size of the ball. If known to be large, the question is settled, and the sooner the operation is performed the better. The only reason for delay is shock, which must first be allowed to pass off somewhat before the shock associated with every operation is added. An endeavour, however, must be made to operate before general peritonitis has set in. Approximately it may be said that this serious complication commences, as a rule, within the first six hours.

Wounds produced by pellets of small shot, and especially when the symptoms at the outset are very slight, do offer, at the first sight, considerable temptation to delay operative interference. Experience, however, teaches that death is the most common result in these cases, and hence laparotomy should not be delayed. The only instances where there would seem to be reason for non-interference are those cases, seen for the first time some twelve to twenty-four hours after the accident, in which the patient appears free from any serious symptoms. Here it is possible that nature is effecting repair, and that no extravasation has taken place into the peritoneal cavity. To operate under such circumstances might possibly unnecessarily interfere with the reparative process.

The operation.—If it is right to speak of more care in performing laparotomy for one cause than for another, then such additional care should be exercised in the treatment of shot-wounds of the intestine; for this reason, that it is always necessary to handle and examine the whole length of the intestinal canal. Hence every precaution as regards warmth and cleanliness must be adopted to protect the bowels during the necessary exposure and manipulation to which they are subjected.

A median incision below the umbilicus is the one usually selected, as affording a better opportunity of both examining the abdominal contents and treating the wounds found.

As in the case of incised wounds, the escape of gas or fæces on opening the abdomen will definitely indicate the existence of perforation.

A loop of bowel is picked up, and one end carefully traced until a perforation is met with. After this is closed, the search is continued, for it must be remembered that many perforations may be present—as many, indeed, as sixteen have been met with in one case—and closed with a successful result.

As regards the treatment of the bowel lesion, all depends upon the nature and extent of the injury. The simplest and best method, when it can be done, is to close the aperture by a few Lembert sutures; the pouting mucous membrane should be turned in and the opposing serous surfaces united. If any portion of the bowel is so badly damaged, either from the size of a single aperture or the proximity of several wounds, that simple union does not appear possible, removal of the part will be necessary.

The condition of the mesentery should be carefully noted as the examination of the bowel proceeds; this is the more necessary when there is evidence of considerable hæmorrhage. No doubtful bleeding point or lesion in the mesentery should be left unsecured.

After both small and large intestine have been completely and carefully overhauled and all lesions treated, the abdominal cavity must be freely and efficiently irrigated, with the insertion of a drainage tube, if considered advisable.

As regards after treatment, everything must be carried out on the general principle of rest, sufficiently discussed in detail already under other operations upon the alimentary canal. (See page 158.)

There are various points—such, for instance, as the shape of a ball, whether round or conical, the nature of its mantle, &c.—which have a bearing upon the kind of lesion produced, that are unnoticed here. Upon these and many other considerations, works on military surgery must be consulted.

CHAPTER XXX

FOREIGN BODIES.

It would involve far too extended a discussion of the subject to attempt to deal with all the foreign bodies which may pass into, pass through, or arise within the intestinal canal. It is only proposed to consider some of these, and more particularly to treat of the troubles to which, when impacted, they give rise.

In treating the subject both the small and the large intestine will be considered, for while there may be some slight differences, there are many more points of agreement. The lesions which may arise as the result of impaction in either portion of the bowel are much the same.

Nature of foreign bodies.—It need scarcely be pointed out that there is hardly any limit—except regarding size—in shape, consistency, and weight of the bodies which may become lodged in some part of the bowel. In the case of sane people it is frequently some article of diet, such, for instance, as a fish-bone, or other small bone, either whole or in fragments, fruit-stones, &c.; while in lunatics, and those who practise tricks of jugglery, they are knives, forks, spoons, tobacco-pipes, broken pieces of china, glass, &c. In the former class of patients it more frequently happens that nothing is known of the fact that something has been swallowed likely to account for the symptoms which subsequently arise, except in such instances as the accidental swallowing of a dental plate, a coin, a pin, and such-like articles. In the latter class, however, some clue usually exists from the absence or loss of certain articles previously known to have existed, and the confession on the part of the individual.

There is a class of bodies of natural formation within the intestine which are sometimes the cause of serious troubles—namely, intestinal concretions or enteroliths, and biliary calculi. These will receive separate consideration later.

Course of a foreign body in process of natural expulsion.—The best guide to the symptoms connected with the lodgment or impaction of a foreign body is a knowledge of the processes which nature adopts for its expulsion.

While it is possible for the body to lodge and produce its ill effects in any part of the canal, from the duodenum to the sigmoid flexure, it more frequently happens in the neighbourhood of the cæcum. Here it may become impacted in the narrowed orifice of the ileo-cæcal valve, or lodged in the cæcum.

The following pathological events may occur where a foreign body becomes lodged at any particular part:

(1) It causes ulceration of the bowel, which,

(2) Without the previous formation of adhesions, may lead to perforation directly into the peritoneal cavity, but which,

(3) With adhesion, may lead to a localised abscess.

(4) The abscess bursting may create a communication with (*a*) the outside of the body, (*b*) the interior of some neighbouring viscus, or (*c*) the general peritoneal cavity.

(5) It may cause temporary obstruction or

(6) Acute intestinal obstruction.

(7) Certain bodies such as needles may pass innocuously through the tissues.

Symptoms.—(1) *When the body causes ulceration.*—Whether or not symptoms manifest themselves in connection with ulceration of the bowel, will depend mostly upon the amount of ulceration present. Even when small it may lead to enteritis, but when large and extending around the entire circumference of the bowel, it may be followed by stricture. The symptoms in connection with these conditions will be chiefly those of bowel irritation, as shown by diarrhœa, pains mostly of a colicky character, and other disorders connected with deranged intestinal action. As stricture advances and the canal becomes narrow, symptoms of obstruction may set in either gradually or more or less suddenly.

(2) *Perforation of the bowel without adhesions.*—In all cases where previous thinning of the bowel has taken place by ulceration, or the immediate perforation of the intestinal wall has been of larger dimension than such as might be

produced by the passage of a needle, the immediate result of the extrusion of the body into the general peritoneal cavity is to set up acute peritonitis. In these cases it not infrequently happens that the patient is enjoying perfect health, with no indication of any bowel trouble, up to the moment perforation takes place. Then follow acute pain, collapse, and later all the symptoms of peritonitis, from which the patient rapidly dies.

(3) *Perforation after the formation of adhesions.*—In any case of slowly progressive ulceration, as the result of the impacted body, it is more than likely that some inflammatory process will advance beyond the actual seat of ulceration; and as soon as this reaches and involves the peritoneal surface, adhesions usually take place between the affected part and some neighbouring tissue or organ. Any escape, therefore, of the body into the general peritoneal cavity is for the time being prevented. The body, however, gradually finds its way out, accompanied possibly with some of the septic contents of the bowel. It forms a bed for itself in the midst of the newly formed adhesions. Up to this stage there may have been no symptoms to indicate the process which was taking place within the abdomen. Any further advance, however, will soon become manifest. One direction in which this may take place is in the formation of an abscess, which, as it increases in size, may finally burst, either through the parietes externally, internally into some viscus, or into the general cavity of the peritoneum. The various symptoms, therefore, which may develop will depend upon which of these courses is taken.

(4) *The abscess bursts* (*a*) *externally.*—That the abscess is tending towards the surface of the body soon becomes manifest.

The first symptom will be the feeling of a tumour in the abdomen, somewhat tender on palpation. As the parietes and skin get involved, the evidence of inflammatory mischief becomes more prominent, until it is sufficiently clear that an abscess exists. With the exception of possibly some rise of temperature, these conditions may progress, especially in the earlier stages, with little or no constitutional disturbance. If the abscess is not opened it will burst, and then, if the body be not ejected at the first, either continue to discharge through a fistulous opening or leave the more

serious condition of a fæcal fistula. The latter condition depends upon the size of the ulcerated aperture in the bowel left after the passage through it of the foreign body. If, on the other hand, the body be removed while the communication with the bowel has already healed, a complete subsidence of all symptoms should follow.

The treatment of any case depends upon the stage to which the process has extended. Any attempt of the surgeon to deal with it at its earliest period, when little more than an ill-defined tender tumour can be felt within the abdomen, must be undertaken with care. Although the abscess may be localised, it may not yet have contracted adhesions to the parietes, so that any endeavour to open it necessarily involves opening at the same time the general peritoneal cavity. If an exploratory operation is decided upon, the treatment of the abscess when opened will depend upon whether or not there is any material communication with the bowel. If there be no bowel communication, then after emptying the abscess cavity it should be dried and dusted with iodoform or stuffed with iodoform gauze. If, on the other hand, the serious complication of a fæcal fistula exists, the surgeon will have to choose between excision of the part or attachment of the bowel to the parietes and the establishment of a fæcal fistula or an artificial anus. Whatever the difficulty encountered, cleansing the peritoneal cavity must be efficiently carried out.

When there is distinct evidence of an abscess on the abdominal surface, there is little fear that adhesions have not formed with the parietes, and no danger exists therefore of opening the peritoneal cavity. An incision is all that is needed, and if perchance a fæcal fistula remains it can be susbequently dealt with by an intra-abdominal operation, supposing it does not naturally close.

It should be noted that the result of adhesions and the embedding of a foreign body within them does not necessarily lead to the formation of an abscess. In cases where foreign bodies remain for any length of time within the body cavity, it is by such a process of adhesive formation that they are cut off and kept secure for variable periods. At any time, however, inflammatory mischief may be set up and the sequence of events above described take place.

(*b*) *The abscess bursts into some viscus.*—This termination of nature's endeavour to get rid of a foreign body is rare; and from recorded cases it would seem that the bladder is the viscus most frequently perforated. It is usually not until the body has ulcerated its way through, or an abscess has burst with ejection of the body into, the bladder that symptoms of any urgency arise, and then those that do appear are solely connected with that organ. The patient soon complains of irritability of the bladder; there is frequency of micturition associated with pain. The urine may contain particles of fæcal material and pus, and when passed be accompanied by gas. The passage of a sound may or may not detect the presence of the body. Bodies which pass into the bladder from the bowel may be naturally expelled *per urethram;* failing such a result, they will need to be removed either by perineal or suprapubic cystotomy. In cases where a fistula exists between the bowel and the bladder, it may be considered necessary to perform an abdominal operation to close the two apertures. This, however, should not be attempted until nature has been given a fair trial to effect occlusion.

(*c*) *The abscess bursts into the peritoneal cavity.*—This rarely happens as a natural result. The tendency rather is for adhesions to form with other parts, and so protect the peritoneal cavity. The cause most likely to bring about such an untoward result is some undue and sudden exertion on the part of the patient. To the surgeon nothing is suggested beyond the fact that possibly perforation has taken place. The only treatment, therefore, of any value is exploratory laparotomy. The discovery of a foreign body or fæcal material within the abdominal cavity should lead to a close and careful search for any perforation in the bowel. The further treatment of the case will depend upon the state of the parts found, and may be considered sufficiently dealt with under (*b*), where similar conditions exist.

(5) *Causes temporary obstruction.*—A foreign body may be the cause of temporary obstruction, arising either shortly after it has entered the bowel or much later, when it has caused ulceration and possibly led to stricture.

When the cause remains after the symptoms have subsided, there is a likelihood of recurrence at some future date, with the possibility that the subacute or temporary

attack may at any time become acute and fatal. This latter result is most liable to occur where stricture is the cause of the obstruction. In such cases it needs but an effectual plug to completely block the narrowed aperture to produce acute obstruction.

The symptoms of temporary obstruction are mostly those of the acute form, only in a much less marked degree. The patient may vomit, pass neither fæces nor flatus *per rectum*, although suffering from constant tenesmus. There will be a feeling of abdominal discomfort which may amount to pain. There is usually an absence of those general constitutional symptoms which present such a marked feature in the acute form. The pulse is normal, the face not pinched or sunken, the tongue moist, and the patient not painfully distressed. The attack may last for two or three days, when flatus begins to pass, fæces follow, and all the symptoms subside.

In treating this condition the patient should be confined to bed. Purgatives should be avoided, but small doses of belladonna combined with a little opium should be administered. The rectum and lower part of the large bowel should be emptied by the use of large fluid enemata, which may be repeated some three or four times. Nourishment should be limited to milk and easily digested soups and other fluid material. The stomach, however, will probably tolerate but little, and should not therefore be burdened with too much of anything.

(6) *Causes acute intestinal obstruction.*—A fuller description of acute obstruction from causes of this character will be found later on, but it may be briefly alluded to here.

The causes which give rise to temporary obstruction may equally lead to the acute, fatal form.

In some instances it may be possible to trace the symptoms to their true cause; more frequently, however, a considerable time elapses between the ingestion of the body, or its passage into the bowel, and the onset of acute symptoms. In cases of stricture resulting from ulceration the effect of an impacted foreign body, it is hardly likely that the true cause of the sudden obstruction will be correctly divined, although there may previously have existed symptoms indicative of chronic obstruction. (See also Obstruction from Gall Stones.)

(7) *Effects produced by wandering needles.*—It occasionally happens that needles swallowed find their way through the tissues with comparatively slight inconvenience to the patient. It would appear that these are about the only foreign bodies which having passed out of the bowel may become encysted, and so remain for indefinite periods embedded in the tissues.

Cases are not infrequently recorded of foreign bodies getting into a herniated loop of bowel. The body becomes impacted, and changes are set up which lead to symptoms suggestive of strangulated hernia. It should be remembered that in all questions connected with the possible presence of foreign bodies in the intestine we can now call to our aid the invaluable diagnostic properties of the Roentgen rays, while in all cases where the body is such as to obstruct the rays we may obtain a skiagraph of it.

CHAPTER XXXI.

TUBERCULAR AND TYPHOID ULCERATION.

The small intestine may be affected by many forms of ulceration, but it is only necessary to consider here two kinds, tubercular and typhoid, which are liable to give rise to complications calling for surgical intervention.

Tubercular ulceration.—This form of ulceration, so frequently met with in advanced cases of pulmonary phthisis, affects mostly the lower part of the ileum, although any portion of the canal up to the duodenum may be involved. The tubercular process attacks almost exclusively Peyer's patches and the solitary glands. At an early stage of the disease the glands contain numerous grey granules which later form yellow cheesy masses, and these latter breaking down give rise to the ulcer. The tendency is for the process to extend transversely in the direction of the blood vessels, so that in extreme instances the bowel is completely encircled by ulceration. Invasion may also take

place in a longitudinal direction, producing therefore ulcers of considerable variety in size and shape.

The ulcer in its most typical form presents an excavated appearance, with thickened overhanging edges and an irregularly tuberculated floor (see Fig. 36). The inflammatory thickening which precedes the process of ulceration

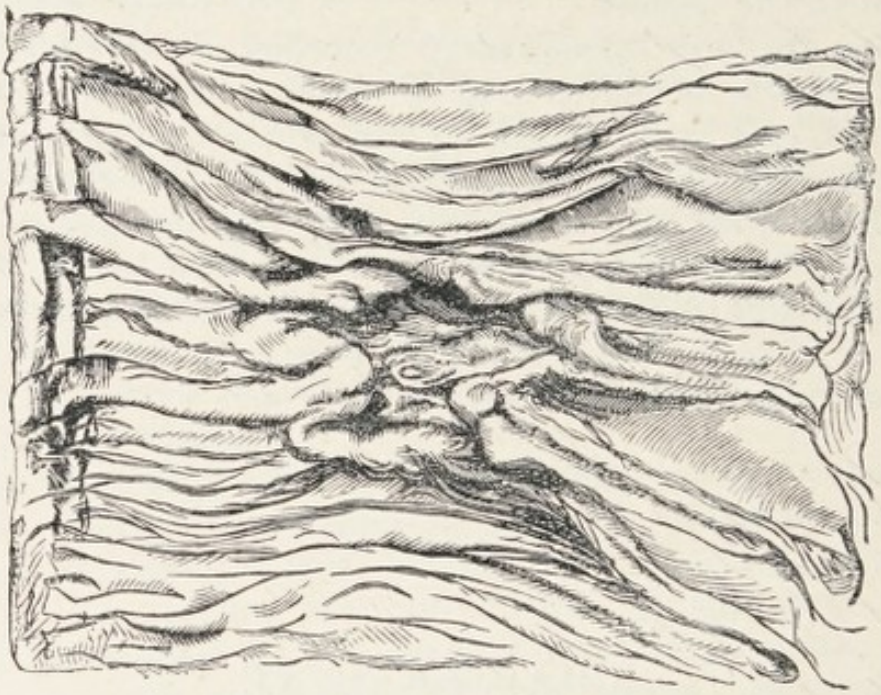


FIG. 36.—Tubercular Ulcer of Intestine. Naked-eye appearance. (Coats.) The swollen overhanging edges are indicated.

tends to prevent perforation, although in exceptional instances this latter result ensues.

While ulceration is progressing in one part of the ulcer, cicatrisation may be taking place in another; and where in any case the ulcer has extended entirely round the bowel, the subsequent healing may lead to stenosis at that particular part.

Occasionally adhesions take place between the floor of the ulcer and neighbouring parts. In one case which came under my own observation, the bowel had become adherent to the parietes on the left side of the umbilicus; a chronic tubercular abscess formed, and pointed beneath the skin. The abscess was opened and scraped. A few days later a fæcal fistula unexpectedly appeared. The patient eventually died, when it was shown at the post-mortem that the tubercular process was one which had extended from the bowel outwards through the parietes.

Symptoms.—The symptoms connected with tubercular ulceration of the bowels are in many instances not specially distinctive. When the lower part of the ileum is markedly involved there may be tenderness and more or less pain in the right iliac fossa. The bowels may move freely, amounting in the severer forms to obstinate and uncontrollable diarrhœa; in other cases there may be constipation. When the bowel symptoms are marked, other constitutional disturbances will become manifest, such as emaciation, hectic, night sweating, and those many well-recognised indications of advancing tuberculosis in other parts. For a further and more detailed description of these conditions, medical works should be consulted.

Treatment.—From a surgical point of view it is only necessary to consider the possible complications, such as perforation, stricture, and localised abscess. So far as these are concerned they are all too rarely met with to admit of any statement regarding treatment other than that which is included under general surgical principles. If other circumstances allowed, perforation might be reasonably dealt with in the same way as in the case of perforations occurring from other causes; and as regards stricture, excision or some form of plastic operation may be required. An abscess arising in connection with an ulcer should be opened and drained without further interference in the way of scraping.

Typhoid ulceration.—Ulceration of the bowel in typhoid presents some features of marked contrast to that of tubercular ulceration. One of the chief points of distinction is the tendency of the former to perforation, and in this particular feature it contributes the one important factor of interest to the surgeon.

Inasmuch as the process of ulceration attacks the solitary and agminated follicles, the ulcers are found wherever these glands normally exist. Thus, then, they are most prominently present in the lower part of the ileum. The ulcer in its most typical form assumes the size and outline of the follicle attacked; in the case of agminated follicles or Peyer's patches, it is oval and in the longitudinal axis of the bowel. It contains either a yellowish slough on the point of separation, or the shreddy remnants of one which has become detached. The floor of the ulcer after

separation of the sloughs is thin and may be formed of the muscular coat, or, in cases where the ulcer is approaching perforation, nothing but the thin serous coat may intervene.

The result of ulceration is to produce either a localised abscess or general peritonitis. The former, from its excessive rarity, may be passed over, although the possibility of its occurrence should be borne in mind. The latter is not infrequent, and almost without exception fatal. Cases have been reported where it is supposed perforation has taken place and recovery ensued. There is, however, the great difficulty of deciding with any degree of certainty whether in these cases of recovery perforation did actually take place. And, further, there is the question whether the supposed perforation might not have been due to some other concurrent disorder.

Hawkins* has contributed some valuable statistics with regard to the frequency of perforation, the period of occurrence, and the seat of perforation.

Frequency of perforation.—In the case of children from 2 years to 15 inclusive, out of twenty which were fatal in a total of 251 cases of typhoid, six owed their death to perforation. In adults a similar number of investigations showed a mortality of forty-three, out of which eighteen died from perforation.

Period of occurrence.—In children perforation occurred during the third week in one case, during the fourth week in two cases, during the ninth week in one case, and during a relapse in two cases.

In adults the perforation occurred during the second week in two cases, during the third week in six cases (at the early part in three cases, in the middle in one, and at the end in two cases), at the end of the fourth week in two instances, during the sixth week in one case, during the seventh week in two cases, and during the eighth in one. The dates in the remaining four cases are not given.

Seat of perforation.—As the result of an investigation of seventy-two necropsies where perforation had caused death, Hawkins found that in sixty-one instances the ileum was perforated at distances above the ileo-cæcal valve varying

* *Lancet*, 1893, vol. ii. p. 245.

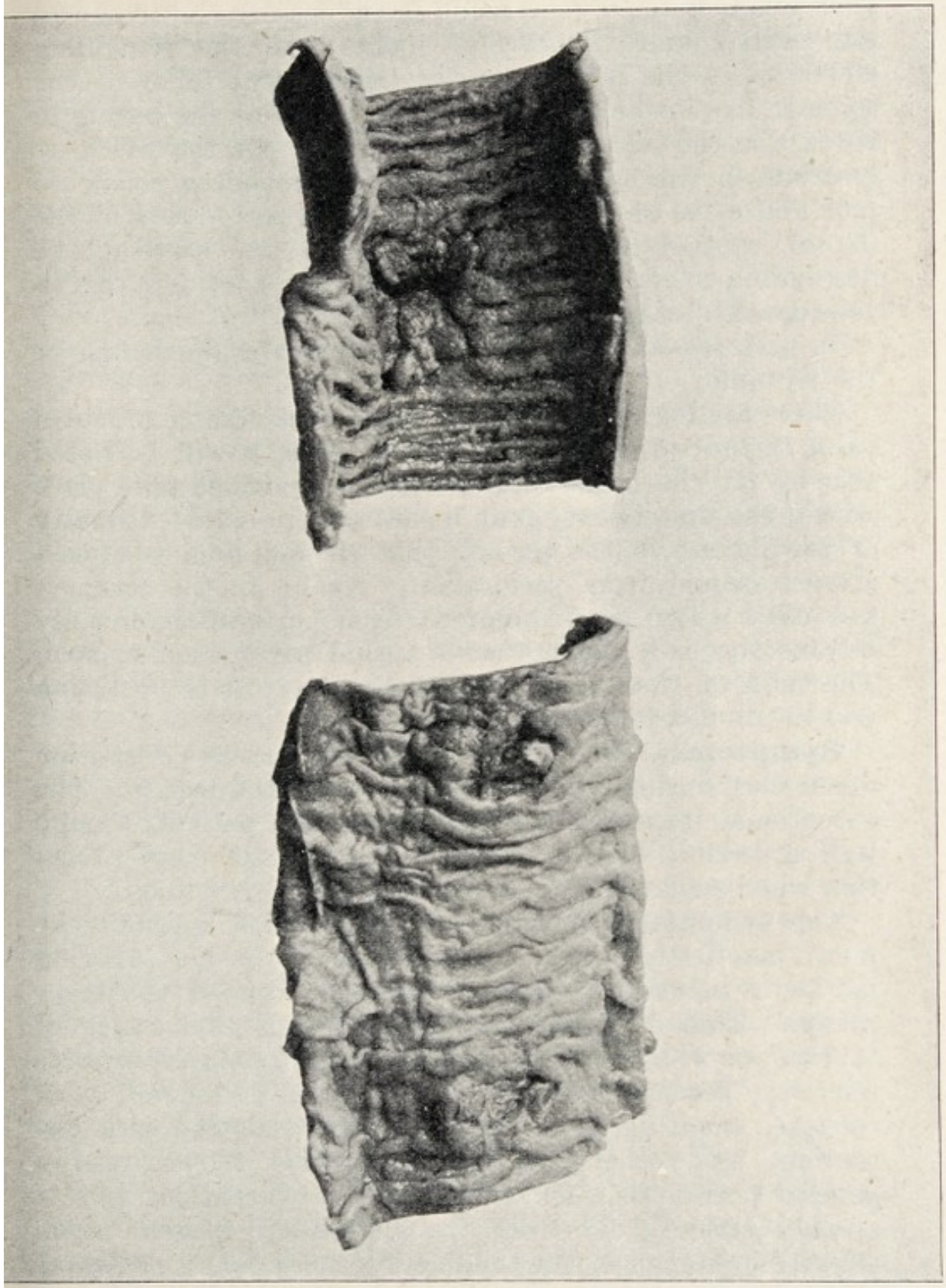


FIG. 37.—TYPHOID ULCERATION AND PERFORATION.—The upper specimen has a piece of whalebone passing through a perforation in the centre of a slough, which had caused peritonitis (*W.I.M., Glas.*)

from one inch to six feet, being in the majority of instances six, twelve, and twenty-four inches In the remaining eleven cases the perforation was situated as follows: the colon in five instances, the anterior surface of the cæcum in three, and the cæcal appendix in three. Of the five perforations in the colon one was in the ascending colon, an inch above the cæcum (there being also a perforation in the ileum), another in the transverse colon, and three in the descending colon, two being in the upper part and one in the sigmoid flexure.

In no case was a perforation found in the duodenum or the jejunum.

There are facts in these statistics of considerable practical value to the surgeon. In the first place, it will be noted that by far the largest number of perforations take place within the first twenty-four inches of the cæcal extremity of the ileum: in the second, that the jejunum is almost always exempt from perforation. Again, in the seventy-two cases where death occurred from perforation, in only one instance is it noted that a second perforation existed. The value of these facts considered in regard to operation will be alluded to later.

Symptoms.—In all but exceptional cases perforation takes place during the obvious progress of the disease. The exceptional instances are those where the patient, though feeling possibly unwell, is continuing his customary avocation when suddenly he is seized with acute symptoms.

The symptoms connected with perforation appear to be more manifestly acute when the patient is not suffering markedly in other respects from the effects of the fever poison. Thus a patient who has only a mild attack of typhoid, or who is making apparently good progress towards recovery, becomes attacked with intense abdominal pain, collapse, vomiting, tenderness over the abdomen with distension, and other symptoms indicative of progressing general peritonitis. On the other hand, a patient who is already seriously ill from the disease will present much slighter indications; the sudden onset of a change, however marked it may be by signs of collapse, with a fall in temperature, increased rapidity and feebleness of pulse, rapid thoracic respiration, and distension of the abdomen, should be looked upon as indicative of perforation. "The sudden

appearance in the course of enteric fever of symptoms of intense collapse even when no distinct evidence of abdominal inflammation is present, points to the occurrence of perforation" (Bristowe).

Treatment.—The introduction of the question of operative intervention in the treatment of perforation is of comparatively recent date. According to Louis,* who has carefully investigated the subject, Leyden in May 1884 was the first to suggest treatment by laparotomy, while Mikulicz, who read a paper upon the subject in September of the same year, appears to have been the first to act upon the suggestion. The perforation was sutured and the patient recovered. The operation, at first comparatively infrequent, has now come to be the established method of dealing with every suitable case. And it may be truly said that not to subject a patient to laparotomy under such circumstances is to fail in carrying out the only and proper means to save life.

The conditions of the patients in whom perforations take place vary so widely that the prospects of a successful operation in any particular case can only be properly reckoned by carefully taking them into account. Thus, to open the abdomen when perforation has occurred in a patient who is in the height of the disease and in a low typhoid condition can hardly be considered comparable, as regards the prospects of success, to one in whom convalescence has reached an advanced stage, and the patient therefore in a much more fit condition to stand the additional strain of an operation.

Operation.—Every means must be taken to operate with the greatest possible rapidity, and with much care in manipulating the inflamed and ulcerated bowel; to ensure the efficient closure of the perforation, and the perfect cleansing of the peritoneal cavity.

The abdomen should be opened by a median incision below the umbilicus. The hand is then inserted, and the ileum at its junction with the cæcum sought for in the right iliac fossa. The ileum is examined by tracing it upwards or away from the cæcum. As soon as a perforation is met with, it should be brought sufficiently into view to enable sutures to be passed.

* *Le Progrès Médical*, 1890, vol. xii. p. 512.

The perforation and the ulcer, of which it is a part, should be folded in, and the serous surfaces united over the ulcer in the long axis of the bowel by a series of Lembert sutures. The rarity of a second perforation renders it not absolutely necessary to subject the patient to the prolonged exposure and manipulation required to examine the whole length of the intestinal canal. Such examination may, however, embrace the lower few feet of the ileum, and must be carried out *in extenso* when failure to find the perforation in the more common seat of the iliac fossa happens.

After returning the sutured bowel the abdominal cavity must be carefully cleansed, either by irrigation with warm normal saline solution or by simply wiping out. If deemed advisable the neighbourhood of the intestinal wound must be stuffed with iodoform gauze. The cavity of the pelvis should be carefully looked to. If deemed advisable a drainage tube may be used, conducted well down into the pelvic cavity. The parietal wound is finally closed with the exception of the aperture left for the tube when the latter is used, or for the gauze stuffing when the deep parts are packed.

It is well to remember that when doubt exists as to the possible future perforation of other ulcers, the spreading of the omentum over the suspected part adds considerable security and support to it.

As modifications of this method of operating, Lücke's suggestion of making an artificial anus, by stitching the bowel at the seat of perforation to the parietal wound, may be carried out; and in female cases Douglas's pouch can be efficiently drained by a tube passed into it from the vagina.

CHAPTER XXXII.

OBSTRUCTION.

1. INTERNAL HERNIA.
   (A) INTO NORMAL PERITONEAL FOSSÆ.
   (B) THROUGH ADVENTITIOUS OR CONGENITAL APERTURES.
   (C) UNDER BANDS, CORDS, DIVERTICULA, &C.
2. ADHESIONS, KINKING.
3. INTUSSUSCEPTION.
4. VOLVULUS.
5. STRICTURE.
6. GALL STONES, INTESTINAL CONCRETIONS.
7. TUMOURS OF THE BOWEL WALL.
8. PRESSURE FROM WITHOUT.
9. PERITONITIS, ENTERITIS.
10. CONGENITAL ABNORMALITIES, MALDEVELOPMENT.

WHILE it is usual in most text-books to treat, under the head of Intestinal Obstruction, the large as well as the small intestine, I have preferred to keep to the original scheme I had in view of dealing as far as possible with certain regions, only combining portions where the affections involving them are practically inseparable.

The part played by the jejunum and ileum in intestinal obstruction comprises considerably more than that of any other portion of the alimentary tract. The greater length of this section of the canal, its greater mobility and more exposed position, naturally predispose it to sources of obstruction not met with in other parts.

Obstruction of either the jejunum or the ileum may be brought about by causes external or internal to the canal, but not organically connected with it, and by changes involving the bowel wall itself. Remembering this and the

fact that this section of the alimentary canal consists of a long tube, freely movable, with soft and easily compressible walls, it requires very little effort to conjure up in the mind the various conditions which might prove the direct source of obstruction. Thus the tube may become blocked, bent, twisted, compressed, kinked, and so on. But such conditions need to be technically expressed, and their enumeration, as expressed in the heading of the chapter, forms the basis for their consideration.

1. **Internal hernia:**—(A) **Into normal peritoneal fossæ.**—Anatomically, and independent of the common parietal seats of hernia, there may be said to exist within the abdomen four situations in which a loop of intestine may become strangulated. Three of these are classed as retroperitoneal; the bowel passes into fossæ which are formed of pouches of peritoneum lying between the parietal layer of that membrane and the muscles. One of these fossæ is known as the "duodeno-jejunal," and is situated, as the name implies, at the end of the duodenum, close to its junction with the jejunum, and behind the Inferior Mesenteric Artery. The pocket which normally exists there is formed by the reflection of the parietal peritoneum to the duodenum.

A second is that known as the "pericæcal," and comprises several fossæ situated around the cæcum; the commonest seat is behind the cæcum—"retrocæcal," or subcæcal.

The third is termed "intersigmoid"; a fossa which is found at the root of the pelvic meso-colon.

The fourth seat of internal hernia, through a natural aperture, is that through the foramen of Winslow.

In cases where acute strangulation occurs in one of these situations, it is not always easy to determine the exact position of the peritoneal pouch at the time of operation. It is only when death occurs, and a careful post-mortem dissection is made, that the situation of the constricting fossa can be accurately located. Thus in many of the recorded cases the nature of the hernia is only indefinitely stated and it is not possible to classify it in one or other of the situations above described.

Another class of internal hernia comprises those where the bowel or omentum slips into pouches of peritoneum either congenital or acquired, about the neighbourhood of the

bladder; when occurring in front of the bladder they have been termed "prevesical" or "properitoneal."

(B) **Through adventitious or congenital apertures.**—Cases occasionally occur where a loop of intestine becomes strangulated through a slit or aperture in some membranous expansion, either normal or pathological. Thus, as the result usually of some antecedent accident, a slit is produced in the mesentery, and through this a loop of bowel slips and becomes strangulated In other instances the slit has been formed in a membranous band or expansion the result of stretched adhesions.

In some cases it would appear that these slits in the mesentery may be of congenital origin.

The only case of this kind which has come under my own observation I believe to have been an illustration of an adventitious aperture. About four feet of the ileum, eight inches above the ileo-cæcal valve, had passed through an aperture in the mesentery close to its spinal attachment. The edges of the opening were thickened and smooth. The bowel was acutely constricted, and the four feet ensnared were in an advanced state of gangrene. The history of the case tended to show that some lesion of the mesentery took place three years previously, when the child was run over by a cart.

(C) **Under bands, cords, diverticula, &c.**—In the larger number of cases of internal strangulation the cause is found to be some form of band. It is usual to classify bands according to the structure out of which they are formed. It is thus possible to differentiate three kinds:

(1) Adventitious, the result of stretched adhesions.
(2) Meckel's diverticulum.
(3) Normal anatomical structures.

(1) *Adventitious bands* arise usually from some antecedent local inflammation which has led at the time to a local peritonitis. The resulting adhesions subsequently stretch and give rise to bands, solitary or multiple, which in various ways cause strangulation of the bowel.

Some of the commonest causes of these local peritoneal attacks are, inflammation around the cæcum and appendix; pelvic cellulitis; ulceration of bowel; inflamed mesenteric glands; abdominal operations; operations for external herniæ; and injuries.

In cases where the bands are multiple, the previous peritonitic attack has been general rather than local; and in such instances the cause is usually found to be tuberculosis. Of six cases of strangulation by bands reported by Coats, four owed their origin to healed tuberculosis.

Regarding the size, length, and attachments of these adventitious bands the utmost variation exists; it may, however, be noted that, inasmuch as the chief determining feature of the position and attachment of a band is the situation of the inflammatory focus to which it owes its origin, bands may be expected to be found running between any parts or structures which have become, by natural proximity, glued to the primary seat of inflammation. Thus, then, bands may be found extending between two portions of bowel (see Fig. 38), between bowel and parietes, between bowel and mesentery or omentum, between the bowel or parietes and any of the female pelvic organs.

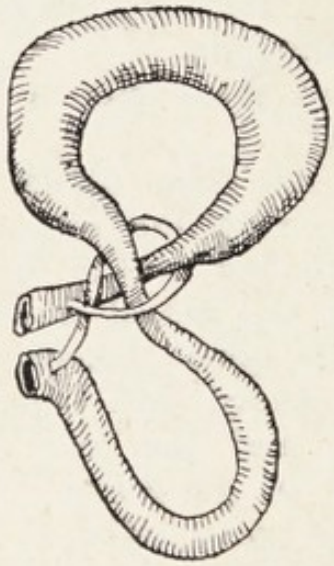


FIG. 38.—Strangulation of a loop of small intestine by a fibrous band passing between the two parts of the gut and forming a knot around a loop. (Museum "Catalogue," Western Infirmary, Glasgow.)

In cases where adhesions form between the bowel and the mesentery or omentum, these latter are liable to be drawn upon so as to constitute in themselves cords capable of strangulating a loop of intestine.

There are numerous ways by which a band may cause obstruction. One of the most frequent and simplest is for a loop of small intestine to slip beneath the cord, which if not tense at the time may rapidly become so. A loop thus caught sometimes rotates, and if not actually strangulated by the band, becomes completely obstructed by the accidentally produced volvulus. A more complicated method of strangulation is for the bowel to become snared by a knot or noose. This can only happen when the band is sufficiently long and the mesentery admits of the torsion and movement of the gut necessary for its production.

(2) *Meckel's diverticulum.*—This constitutes the remnant of the vitelline duct. It is usually found about thirty inches from the cæcum, and, according to Allen, may be found at any spot between fifteen inches and three feet from the ileo-cæcal valve. It varies considerably in length and patency. From forming a simple pouchlike projection

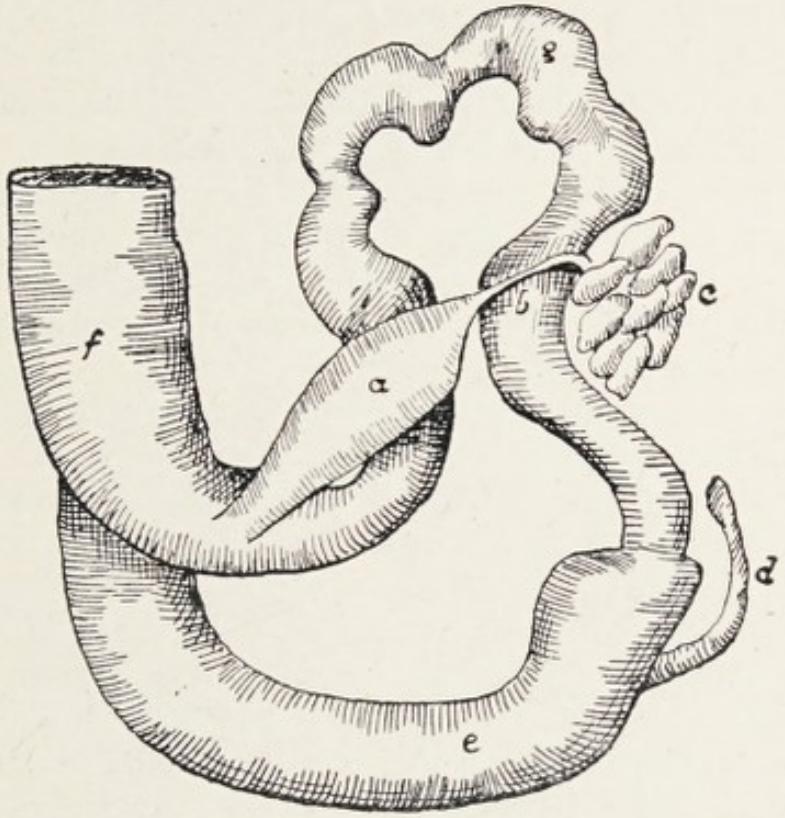


FIG. 39.—Strangulation of a loop of small intestine beneath Meckel's diverticulum.

a, Meckel's diverticulum with cord *b* passing to enlarged glands *c* in mesentery; *d*, appendix attached to cæcum *e*, and colon; *f*, dilated small intestine; *g*, ensnared loop.

from the ileum, it may extend to the umbilicus, where, when patent, it constitutes one of the forms of umbilical fistula. In some cases the diverticulum is only patent throughout a certain portion of its extent, the remaining part being little more than a fibrous band.

The diverticulum, when unconnected with the umbilicus, may remain free in its distal extremity or become attached to some neighbouring organ or tissue. In both conditions it is capable of strangulating a loop of intestine. When free, it strangulates by tying a simple knot round the

bowel; when attached, it constitutes a band beneath which a loop slips, and becomes strangulated as in the case of adventitious cords. As illustrating this latter method, a case which came under my observation affords a good example (see Fig. 39). The diverticulum was attached by its apex to a band which itself was adherent to some enlarged glands in the mesentery. Beneath this a loop of ileum slipped and became strangulated. Additional interest attaches to the case from the effect produced by the tension of the band upon the diverticulum. This latter was found to be gangrenous in almost its entire length.

(3) *Strangulation produced by normal structures.*—The vermiform appendix, the Fallopian tube, the appendices epiploicæ, by becoming attached to neighbouring parts, may form bands beneath which coils of bowel can pass and become strangulated.

In the case of the two former it usually arises from some inflammatory mischief connected with the part. This, by causing a localised peritoneal inflammation, leads to a permanent adhesion, which, as the result of subsequent traction, becomes drawn out into a bandlike form. In the case of the appendices epiploicæ, it is these latter which become attached by a local peritoneal adhesion, either to each other or to some neighbouring part.

Among normal structures causing bands should also be included the omentum and mesentery; for these, becoming attached to some other spot, may be so drawn out as to constitute definite constricting agents.

The method by which strangulation beneath a band is effected.—It is not difficult to understand the mode by which a loop of bowel is strangulated, if the analogy which this form of strangulation presents to that of an ordinary external hernia be borne in mind.

It may be that, like an ordinary hernia, a loop of intestine frequently finds its way beneath the band, but some altered position, or other agency, causes it to slip out again; or that a loop, instead of returning to its normal position. becomes permanently retained, and, if not immediately, probably within a short time, strangulated.

In some instances it is not a matter of a loop slipping beneath a band, but of a band passing transversely across a section of the gut. In such cases the initial processes

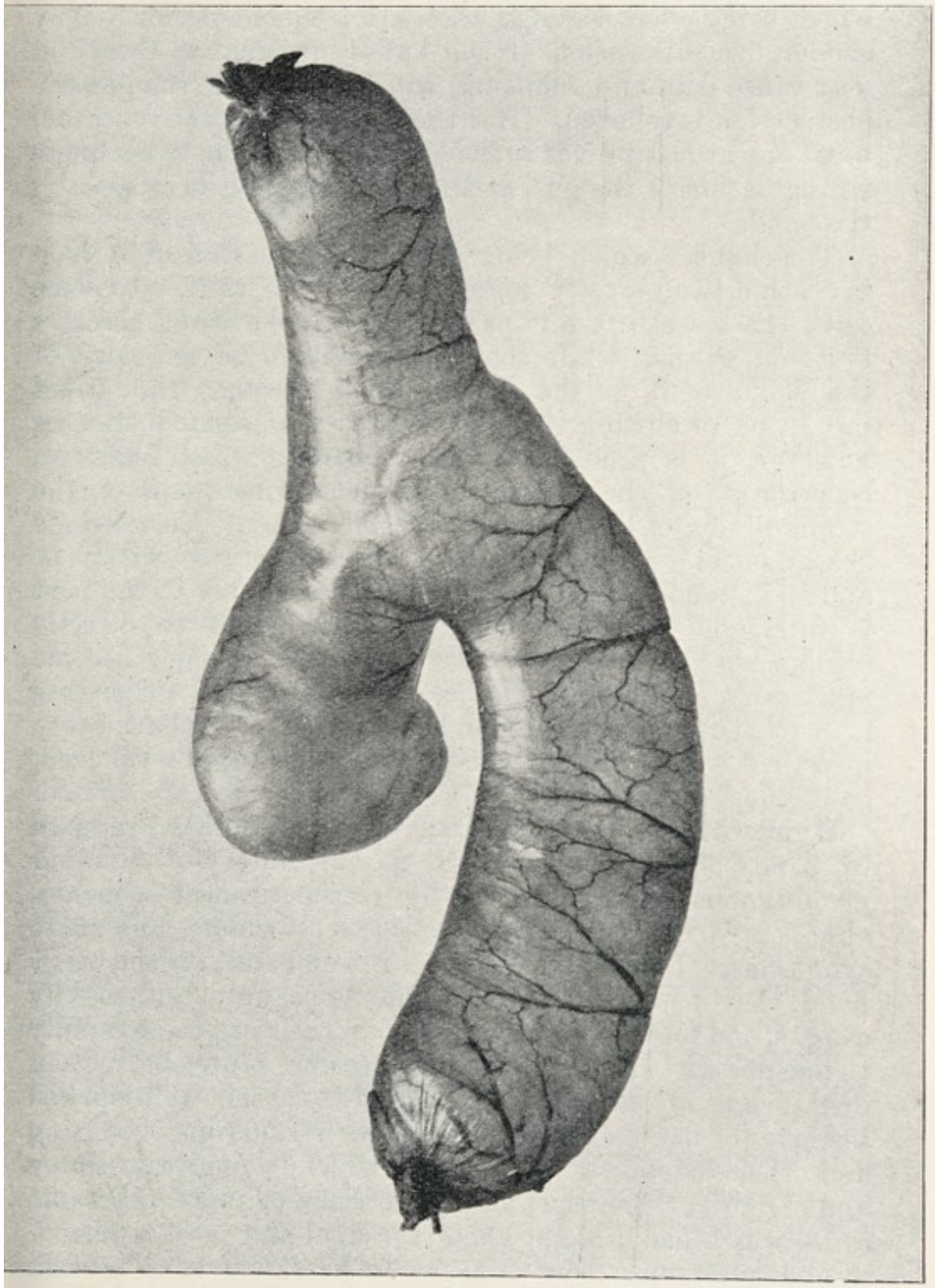


FIG. 40.—MECKEL'S DIVERTICULUM.—It is in the form of an elongated pouch about 1¾ inches in length, and of about the same calibre as the intestine. It was situated about three feet above the ileo-cæcal valve. (*W.I.M., Glas.*)

which bring about strangulation are frequently slow. Any sudden over-distension of the bowel proximal to the band may cause pain and vomiting, which pass off so soon as the obstruction is relieved. But these attacks become repeated, until one at last proves sufficient to bring about a complete strangulation of the gut, at the point where it is crossed by the band.

The changes which bring about the retention of a loop beneath a band mostly concern the bowel itself. In some cases the bowel, after it passes beneath the band, becomes twisted; so that, while the band proves to be the cause of the volvulus, it is the latter which becomes the direct means of producing the obstruction. In some instances, however, it is probable that the changes which follow on constriction of the gut resemble those consequent on the strangulation of an ordinary external hernia. Either some gas finds its way into the loop, or is generated within it, and so distends it that the proper blood supply to the part is interfered with, or the constriction itself so directly compresses the mesentery that its vessels at once become practically occluded. The immediate result in either case is distension of the ensnared loop and engorgement of the intestinal walls. Unless this condition be rapidly relieved, gangrene soon follows.

Symptoms.—Internal strangulation, whether produced by bands or by apertures in the mesentery and other membranous expansions, or by retroperitoneal pouches, almost invariably gives rise to a series of sudden and acute symptoms. It must, however, be remembered, on the other hand, that it is possible for a loop to be only temporarily caught, and for the symptoms, rapid in their origin, as rapidly to disappear. In numerous instances of acute obstruction due to one of these causes, there have been well-marked histories of acute attacks of colic, with sometimes vomiting and other abdominal disturbances which, though transitory and obscure at the time, have been clearly due to the same cause which has brought about the final and fatal attack.

The symptoms may be said to resemble to a certain extent those of strangulation in cases of external herniæ, except that the abdominal pain will be more acute, the vomiting more urgent and persistent, and the physical expression of the patient suggestive of grave internal mischief.

In cases of hernia into a congenital sac, hitherto unoccupied by a loop of bowel, we have frequently the acutest form of external strangulation, where the symptoms commence sharply, or rapidly become acute. Such is the probable explanation of those very acute cases of internal strangulation where the patient, perfectly well at the time, is suddenly struck down by the most agonising abdominal pain, a pain which doubles him up, causes vomiting, and is often followed by much collapse. As time progresses the pain sometimes abates somewhat, but only to return again with renewed severity. In other cases it remains more or less constant, and the vomiting continues until it assumes a fæcal character. This latter state is not generally reached till the fourth or fifth day. Neither fæces nor flatus is passed. The abdomen does not usually show any marked distension, meteorism being a later symptom, and indicative of peritonitis. Palpation of the abdomen may reveal some tenderness. While the pulse, temperature, and respiration may be normal for the first day or two, some rise may take place later; more frequently, however, the temperature falls, sometimes being subnormal. The tongue, clean and moist at the outset, becomes dry and foul later, and when fæcal vomiting has set in, great thirst is frequently complained of. The urine is usually scanty. The patient's mental condition remains intact, but the face often exhibits an aspect of anxiety; the features are pinched, and the eyes sunken and darkly underlined. Perspiration is sometimes profuse, and is seen to hang in innumerable droplets upon a pale and cold forehead. Cases, however, frequently occur where, beyond pallor, the skin of the face is but little altered.

If the patient lives long enough, and no operative measures are undertaken, peritonitis sets in. The abdomen now begins to distend, the pulse grows weaker and more rapid, some rise of temperature takes place, the respiration becomes shallower, more rapid, and partakes more of the thoracic character; vomiting, if not so violent, remains continuous, and death may sometimes be ushered in by slight convulsions.

Such is a brief outline of the course which an ordinary more or less typical acute attack may take. But, just as in the case of external strangulated herniæ, so with internal

strangulation, the amount of collapse, or the degree and frequency of pain; the violence and persistency of the vomiting; the rapidity with which the symptoms succeed each other, may all vary within wide limits; and the variation is probably dependent upon the acuteness of the strangulation and the natural disposition of the patient's nervous system.

Diagnosis.—Regarding the symptoms as present in an acute case, there are none which can be considered pathognomonic. The symptoms of sudden acute abdominal pain, with collapse, vomiting and constipation—conveniently expressed by the term "peritonism"—are common to so many violent disturbances within the abdomen that in most cases diagnosis is purely conjectural. Importance, however, should always be attached to the previous history. It has been shown how frequently the bands which give rise to strangulation owe their origin to some distinct antecedent inflammatory cause. So that any history of an attack of appendicitis, of pelvic mischief in the female, of abdominal injury, of tubercular peritonitis, of tabes mesenterica, of abdominal operations, and of operations for external herniæ should be well considered, as also the history of any previous attacks of colic, vomiting, or intestinal disturbance.

When internal strangulation occurs in children, at which age intussusception is most common, the absence of any distinct tumour, as also the absence of any discharge of mucus and blood *per rectum*, should lead the surgeon to suspect the possible existence of strangulation by band; although it must be remembered that the absence of these symptoms, as will be shown later, does not necessarily preclude even the possibility of intussusception.

Acute obstruction from bands is slightly more frequent in males than in females, and is commoner between the ages of twenty years and forty years than at other periods; the frequency in neither case, however, is sufficient to be of any practical service for diagnostic purposes.

The inevitably fatal result which follows in this class of cases when left alone, and the success which has attended surgical intervention, may be taken as ample justification for operation. And, further, the rapidity with which gangrene occurs in cases of a tense constricting band renders early operation imperative.

Treatment.—Administer an enema containing brandy, and give, as warmly advocated by Mr. Treves,* a hypodermic injection of strychnine ($\frac{1}{60}$ gr. for an adult) just prior to the operation. It is important also that the stomach be washed out before giving the anæsthetic.

A median incision is made below the umbilicus, the opening being enlarged as required. It should be taken as a symptom of some significance when, on opening the peritoneal cavity, clear or blood-stained serous fluid escapes. In many instances the band will give way during the process of manipulation, in other cases it must be divided; and when vascular or formed of some normal structure abnormally attached, care must be taken to ligature or close the parts efficiently.

If the bowel is not gangrenous, the result of relieving the constriction will be to cause it to resume rapidly a more natural appearance, the lividity of its walls giving place to a pinker colorisation, and the distension of the gut above subsiding, while at a not distant period flatus and fæces will pass from the rectum.

Should the bowel be gangrenous, the surgeon must decide from the condition of the patient whether he should adopt the more rapid method of forming an artificial anus, subsequently dealing with the part, or whether he should at once remove the gangrenous portion and form a lateral or end-to-end anastomosis. With Murphy's button end-to-end union after excision can be rapidly effected.

There are certain details in the treatment of all cases of acute intestinal obstruction which may be best considered here. They mostly affect the condition of the small intestine, which, as is well known, rapidly becomes hyperdistended, and, as time proceeds, is liable to be paralysed. It must be remembered that in by far the greater majority of cases in which we operate for acute intestinal obstruction we do so without any knowledge as to what is the cause; these remarks have therefore a very general clinical significance.

Treatment of distended gut in all cases of acute obstruction.—In April of the present year (1899) I published in the *British Medical Journal*† four cases of

* "Intestinal Obstruction," 1899, p. 478. † 1899, vol. i. p. 842.

acute obstruction, in which the distended gut was freely incised and its contents squeezed out with good results. I discussed fully the advantages I believed to be connected with such treatment. I may briefly recapitulate them here. The tendency of hyperdistension is to paralyse the muscular wall of the bowel, and thus paralysed for it to become passively engorged with blood, and so reach a stage in which it may not be able to recover itself. Further, the retained contents of the bowel undergo certain fermentative changes which come to act as a direct poison upon the system, so that it may be possible for a patient to die from a form of fæcal toxæmia when all obstruction has been relieved. To obviate, therefore, these serious conditions, the best practice is, after opening the abdomen for whatever cause of obstruction, to take the first distended loop that presents, withdraw it from the abdomen, and when properly protected incise in the long axis of the bowel for about an inch. This is carefully attended to by an assistant while the surgeon continues to withdraw other coils of bowel and to search for the cause of the obstruction. During this part of the operation fæcal material will possibly continue to flow out of the "evacuatory" incision. When the obstructive cause has been effectually dealt with the surgeon may turn his attention towards a more complete evacuation of the bowel contents. I have done this most freely, by passing in some cases nearly the whole length of the small intestine through my fingers. When the intestines are properly protected, and a very free irrigation of hot normal saline solution is employed, I do not think there is any fear of shock. I have done it several times and never seen anything but the best results. The "evacuatory incision or "incisions"—if it has been deemed advisable to make more than one—is or are then closed by a single continuous Lembert suture. No attempt is made to remove entirely the saline solution, which has freely found its way into the peritoneal cavity. If general peritonitis is present nothing succeeds better than this free flushing with hot normal saline solution. I may add further, that in the presence of peritonitis it is a good practice to make use of the "evacuatory" incision before closing it for the injection of an ounce of sulphate magnesia in solution. To obtain an early movement of the

bowels is desirable from every point of view. It is for this class of case, as also for the somewhat similar one of the stomach, that I have specially devised the operating table to be presently described. (See Figs. 46 and 47.)

After treatment.—In all cases where the bowel has been efficiently liberated fluid diet may be commenced at once. For the first few days small quantities of opium should be given, and the diet should not be too plentiful. The bowels are likely to act freely. In order to obtain a secure cicatrix in the parietal wound, the patient should not be allowed up for about three or four weeks.

CHAPTER XXXIII

OBSTRUCTION (*continued*). 2. ADHESIONS: KINKING.

THERE is a large class of cases where obstruction of both an acute and chronic character arises from adhesions which do not necessarily form well-defined bands. The function of the bowel in this class of cases becomes impaired by reason either of the altered position it is caused to assume by being dragged up or down or fixed, or by the contraction of adhesions constricting it or causing it to be kinked. In some cases it is only a limited portion of the bowel which is involved, while in others the intestines are extensively matted together.

While the immediate cause of these adhesions is some antecedent local or general peritonitis, they are indirectly the result of inflammation connected with injury or disease. Thus tubercular peritonitis is a fruitful source of extensive general adhesions, while operations which involve opening the peritoneal cavity are more commonly the cause of local matting.

Considerable interest attaches to this latter class, from the frequency with which abdominal operations are now performed. Quite a number of cases have been recorded illustrative of serious obstructive troubles arising from the

formation of post-operative adhesions. Lucas-Championnière* records five cases where symptoms of obstruction set in a few days after operation. In one the operation was for the removal of an ovarian tumour, in another for the relief of a strangulated hernia, and in three others for the radical cure of hernia. Rohé† has collected no fewer than seventy-five deaths from acute intestinal obstruction following upon intraperitoneal operations. He states that obstruction of the bowel causes between one and two per cent. of the deaths following ovariotomy and similar operations.

In by far the larger proportion of cases the cause of obstruction is due either to adhesions of coils of intestine to one another, or of these to the abdominal wall or to other viscera.

Symptoms.—Obstructive symptoms may arise in one of two ways, either acutely and suddenly, or slowly with such indications as colicky pains, constipation, occasional vomiting, and other vague feelings of abdominal discomfort. In those cases where the symptoms occur at an interval after an attack of inflammation connected with some internal viscus or with peritonitis, local or general, some clue is obtained as to the possible cause of the obstruction; but in many of the post-operative cases, more particularly in those occurring within a comparatively short time of the operation, the symptoms may be marked by pain, vomiting, and tympanites, results as much likely to be due to the operation itself as to any intestinal mischief directly dependent upon it.

It is more usual, however, for an interval of some days to elapse before any obstructive symptoms manifest themselves. In any case, therefore, where a patient is suddenly seized with acute pain accompanied with obstinate vomiting, symptoms which show no sign of abatement, and to which are added some tympanites and inability to pass fæces and flatus, suspicions should be entertained that the bowel has become obstructed in some way by adhesions.

In cases of obstruction occurring only a few days after operation, the adhesions are usually soft, of the nature of lymph, and easily detached.

* *Revue de Chirurgie*, 1892, p. 264.

† *Annals of Surgery*, 1895, vol. xxi. p. 104.

Treatment.—From the nature of the obstructing agent, nothing but operation can be of any avail. When taken sufficiently early, before the patient begins to show any serious constitutional symptoms, success may be reasonably expected after laparotomy and separation of the adhesions. The cases above alluded to, recorded by Lucas-Championnière, were all successful.

When symptoms of obstruction manifest themselves after ovariotomy or other intraperitoneal operations, no delay should be exercised in re-opening the wound, or, if deemed advisable, employing a fresh incision. When the adhesions cannot be separated without serious injury to the bowel, it will be necessary to remove the involved portion, or perform lateral anastomosis where the coils are free. In a case of my own, the vermiform appendix had such firm adhesions to the neighbouring part of the ileum that in endeavouring to sever them I tore the bowel, and was obliged to excise about three inches. The parts were joined by end-to-end anastomosis, and the patient made an uninterrupted recovery.

In operating upon this class of cases much of the same treatment must be carried out as already indicated in the case of internal herniæ; the patient must be properly prepared and the distended intestine efficiently dealt with (see page 263).

CHAPTER XXXIV.

OBSTRUCTION (*continued*). 3. INTUSSUSCEPTION.

THE passage of one segment of the bowel into another may take place at any point, implicating either the small intestine alone, or the small and the large together, or only the large. By far the largest number of cases are those where both large and small are involved.

It is usual to classify these various kinds of intussusception into *enteric*, *ileo-cæcal*, *ileo-colic*, *colic*, and *rectal*. Only the first three will be described here, the latter being discussed under Affections of the Large Bowel.

In order of frequency the ileo-cæcal stands first, the ileo-

colic is least often met with, and the enteric occupies an intermediate position.

Obstruction from intussusception is much more common during the early years of life. At this period it is usually of the acute and complete form, but when occurring in later years it is often chronic and incomplete.

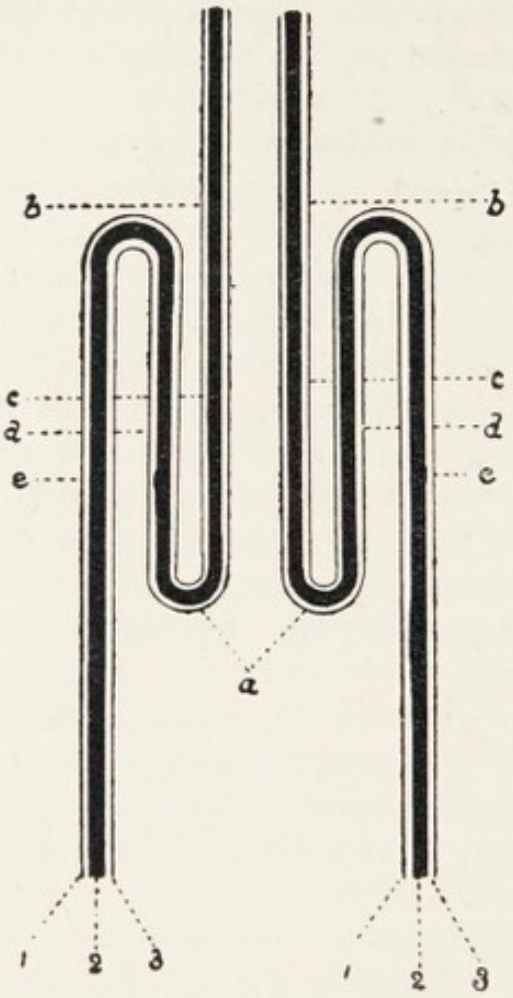


FIG. 41.—Diagram of longitudinal section of an intussusception.

1, peritoneum; 2, muscle coat; 3, mucous membrane; *a*, apex of intussusceptum; *b*, neck of intussusception; *c*, entering layer; *d*, returning layer; *c* and *d* combined form the intussusceptum; *e*, sheath or intussuscipiens.

Pathological anatomy.—The form of intussusception which gives rise to obstruction during life, as contrasted with that which is so frequently found after death and which is probably produced immediately prior to the extinction of life, is almost without exception single, and the result of an upper section of the bowel passing into the section immediately below.

In the *ileo-cæcal* variety a prolapse of the ileo-cæcal valve takes place into the cæcum, and to whatever extent the invagination proceeds, the valve always forms the apex or presenting part.

In the *enteric* variety a portion of the small intestine slips into a section of the same immediately below. This may occur in any part of the jejunum or the ileum.

In the *ileo-colic* the ileum, at its lower part, first passes into a section of its own immediately below, and then proceeding, passes through the ileo-cæcal valve into the cæcum and colon, so that the apex or presenting part is always a part of the ileum. When this variety extends

for any distance down the colon, it is frequently at the expense of the cæcum and ascending colon.

If a transverse section be carried through a simple intussusception it will be found that between the central lumen of the bowel and the exterior there are three layers of gut wall. The external one is termed the *sheath* or *intussuscipiens*, the internal the *entering layer*, and the middle the *returning layer*. The two latter combined constitute the *intussusceptum*. It will therefore be seen that the opposing surfaces of the external and middle layers are formed by the mucous lining of the bowel, while the opposing surfaces of the middle and internal are formed by the serous or peritoneal coat. Between these two latter exists the mesentery. The presenting part of the intussusceptum is called the *apex*, while the point of junction of the intussusceptum with the intussuscipiens constitutes the *neck*. A reference to the accompanying diagram will show the parts designated.

In some rarer instances the intussusception is double and still more rare is the occurrence of the triple variety. In the case of the double kind, a transverse section would reveal two extra layers—that is to say, five in place of three; while in the triple form there would be seven layers.

In length the enteric form is usually shorter than the others. All increase in length is at the expense of the sheath or intussuscipiens, except in the case of the ileo-colic, where for the earlier stage of its course it is the entering layer which continues to pass in. The length of the intussusception is probably determined by the length of the mesentery and the quantity of fat it contains. A congenitally short mesentery or one which contains much fat will materially impede any very extensive process of invagination.

While the mesentery has to some extent an inhibitory effect upon the progress of the intussusceptum, it has also the effect of altering its course and causing pressure upon the neck. Attached to one side only of the bowel, it draws upon that side and more particularly upon the apex. Hence the lumen of the latter is made to look to one side, and the mesenteric border assumes a concavity with a corresponding convexity on the opposite aspect.

Further, this traction, as the invagination increases, renders the intussusceptum liable to become twisted within the sheath.

If the mesentery were removed from the intussusceptum, divided at the neck, and spread out, it would be found to be triangular in shape; the apex of the triangle would represent the part at the apex of the intussusceptum, while the base would correspond to its neck. Hence it will be



FIG. 42.—Ileo-cæcal Intussusception. (Coats.)

The colon is laid open and several coils of ileum are shown which have protruded through the ileo-cæcal valve. One of the coils was gangrenous.

observed that much more is contained within the sheath at the proximal end of the intussusception than at the distal. The effect of this and the other points given above upon the causation of acute obstruction will now be described.

The indirect and direct causes of obstruction.—In discussing the various causes which bring about intestinal obstruction connected with intussusception, it is found

that they group themselves under two more or less distinct heads. First, there are those which are remote or indirect in their effect, and, secondly, those which are immediate or direct.

Indirect or remote.—These causes are connected with the primary formation of the intussusception. While in many cases it does not seem possible to fix upon any particular agent as the initial incentive to invagination, there are not a few in which it is traceable either to mechanical obstruction within the bowel or to the effect of some irregular innervation of the involuntary muscle-tissue forming one of its coats.

The commonest form of an obstructive cause is found in tumours, such as polypi, attached to the mucous membrane. They usually appear at the apex of the intussusceptum, and thus suggest the probable action they take in starting an invagination by suddenly dragging in a section of the intestinal wall.

Another form of obstruction is possibly to be found in the constricted orifice of the ileo-cæcal valve, which, under certain conditions of the contents of the ileum, may be prolapsed into the cæcum.

That irregular innervation of the muscular coat plays a not unimportant part in causing intussusception appears likely from the experiments performed by Nothnagel on rabbits, quoted by Mr. Treves. These experiments went to show that a localised stimulation of the bowel by electricity brought about a contraction which ended in the formation of an intussusception. It is not difficult to take a step further in a clinical direction and assume that certain stimulants lead to a similar localised contraction, with resulting invagination. Whether these stimulants act from a distance through the nervous system, or more directly upon the mucous membrane of the bowel, it may not be always easy to determine. But from the clinical history often obtainable it would seem that in not a few cases gastro-intestinal disturbances have been caused by the ingestion of such irritants as unripe fruit and other indigestible substances.

The fact that in many cases the patients are out of health or debilitated would point to the possibility of there being some want of tone in the muscle tunic, and consequently

imperfect innervation and irregular peristaltic action. When once the invagination has taken place, its further progress is probably brought about by the bowel above tending to force it on.

The direct or immediate cause of obstruction.—The invagination of any portion of the bowel does not necessarily give rise to obstruction at once. The lumen of the internal cylinder may remain sufficiently patent to admit of the bowel contents passing; it is only when from some cause this cylinder becomes partially or completely occluded that symptoms of obstruction become manifest. It will thus be seen that three conditions are possible: (1) where no obvious obstruction exists; (2) where it is partial; and (3) where it is complete.

The changes which take place in the part, and which are now to be described, will serve to explain these conditions more fully, as well as afford elucidation of the difficulties which the surgeon has to encounter in his treatment of them.

Immediately an intussusception is formed, pressure commences to be brought to bear upon the base of the triangular-shaped piece of mesentery at the neck of the tumour. Inasmuch as this contains both the arteries and the veins of the intussusceptum, the effect of the pressure is first to obstruct the veins, and hence impede the return of blood from the part. Should this pressure only be slight, no further changes of an acute character need take place; and, failing any natural reduction, the remoter processes may consist in some organic union of the parts, so that no further obstruction occurs. In some cases the intussusceptum will be gradually cast off, either entire or in irregular shreddy pieces.

Assuming, however, that the effect of pressure on the veins is sufficient to lead to further and more serious changes, it will be found that these changes consist in a gradual engorgement of the coats of the intussusceptum. The part to be first affected will be the apex, then the middle layer, mostly on its convex aspect, and lastly the mesentery itself. The combined effect of these two latter influences will be to produce pressure at the neck sufficient to obstruct the arteries. Hence, with the blood supply entirely cut off, gangrene of the intussusceptum will follow.

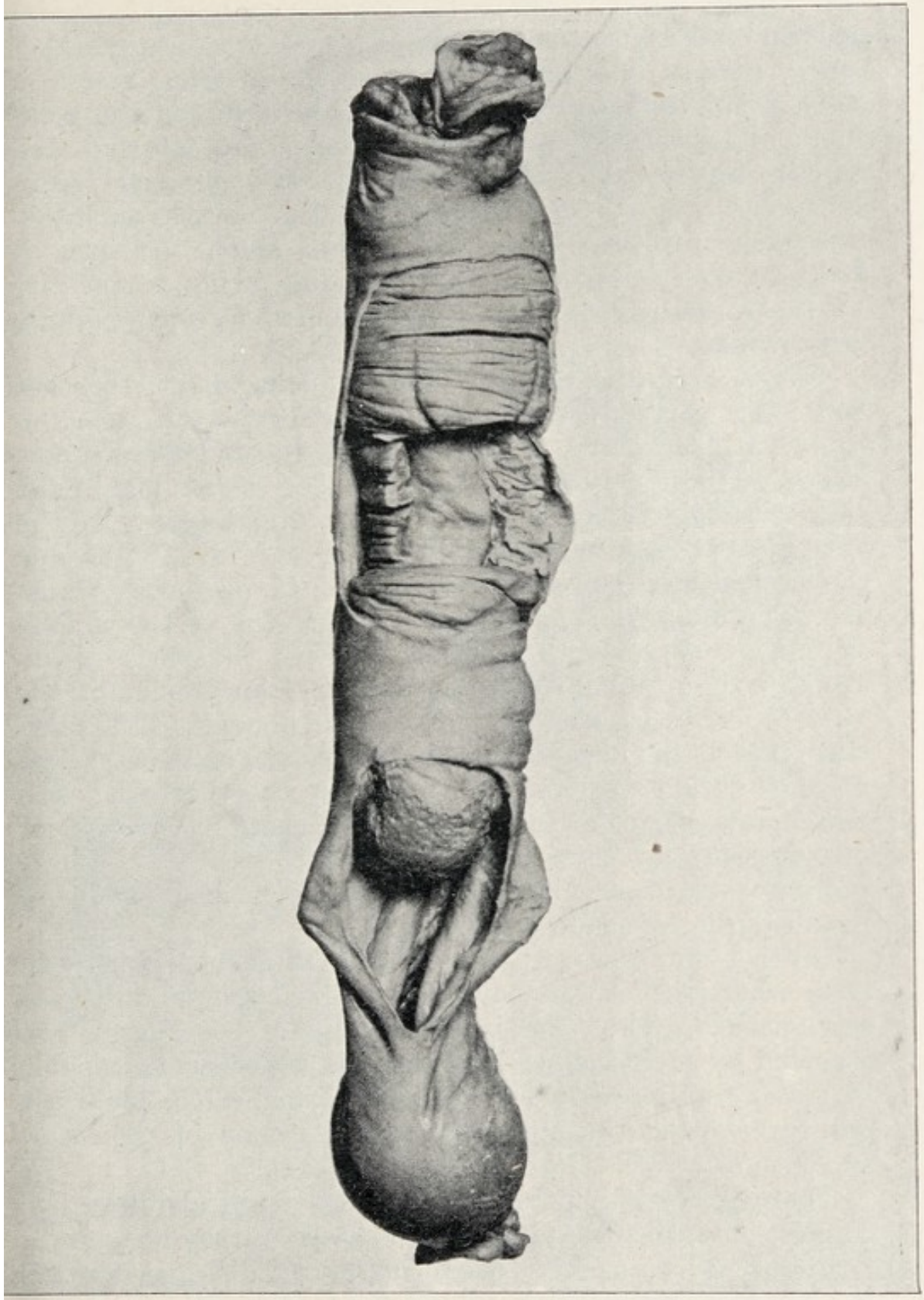


FIG. 43.—ILEO-CÆCAL INTUSSUSCEPTION.—The apex of the intussusceptum is seen through the aperture below. Above, the sheath, or intussuscipiens, is cut away to show the two layers—the entering and returning—of the intussusceptum. (*R.J.M., Glas.*)

The engorgement of the coats, besides leading to extensive œdema and consequent swelling, causes rupture, so that blood escapes into the bowel beyond. Another result of this venous congestion, or of later ulceration, is the occasional formation of adhesions between the internal and middle layers—that is, between the two opposed serous surfaces. The changes effected in the sheath or intussuscipiens are usually slight; when much pressure is brought to bear upon its mucous lining owing to the size of the intussusceptum, some ulceration and even sloughing may result.

Considering the changes thus brought about, together with the part played by the mesentery in its traction upon the bowel, it is not difficult to understand how complete obstruction is effected. The block may exist either at the neck, in the body, or at the apex of the intussusceptum. When occurring at the neck, it is due to the pressure exercised by the mass of mesentery which has been dragged in, plus the engorgement of the middle cylinder from venous congestion. When the block occurs in the body of the intussusceptum, it is from torsion of the part, effected by the mesenteric attachment; and when occurring at the apex, it may be due to the occluding effect of greater engorgement of this part, together with the tilted and narrowed orifice effected again by traction of the mesentery. It will thus be seen that, at whatever point obstruction takes place, the principal agent in producing it is the mesentery.

Obstruction, however, may be brought about suddenly in cases where the changes above described are not in themselves acute. Thus the internal cylinder has become obstructed by some indigestible material which, while capable of passing quite easily through the normal canal, could not get transmitted through the reduced lumen of the intussusceptum.

There are certain points of practical surgical interest in connection with these changes which are worthy of note.

First may be considered the formation of adhesions between the middle or returning layer and the entering layer. Whatever may be the cause of these adhesions, there are considerable difficulties as regards their date of appearance, when reckoned from the onset of the symptoms. Thus, in one

recorded instance they had formed so firmly between the opposing serous layers that reduction was impossible fifteen



FIG. 44.—Intussusception. (O'Connor.)

Slough of ileum measuring 11¼ inches in length with Meckel's diverticulum; passed *per rectum*.

hours after the onset of symptoms. On the other hand, adhesions may not take place for months.

Another point of practical interest is the death and discharge of the intussusceptum. In cases which run either

an acute or chronic course, the intussusceptum may become gangrenous; separation of the dead parts will then commence. This may consist in the discharge of considerable segments of the bowel or of disintegrated shreds. Death of the patient usually takes place in acute cases before separation of any part of the bowel is possible. The figure illustrates a case where eleven and a quarter inches of the ileum with a Meckel's diverticulum attached were cast off and ejected by the rectum eight days after the onset of the symptoms. Several other recorded instances might be cited.

Short of gangrene, the extreme distension of the apex and wall of the intussusceptum often causes fissures in the engorged parts.

Symptoms.—As a class of cases of intestinal obstruction, none presents symptoms which frequently so definitely indicate the true cause. In the greater proportion of the acute cases it is possible to arrive at a correct diagnosis.

In addition to the usual symptoms of acute intestinal obstruction already described under Obstruction from Bands, the existence of a sausage-shaped abdominal tumour situated in the left lumbar or left iliac region, tenesmus with the passage of blood and mucus from the bowel, and the presence of a tumour to be felt *per rectum*, prove a case to be one of unmistakable intussusception.

The symptoms, however, are frequently not so typical. Thus cases have happened where there was neither tenesmus nor passage of blood and mucus; where also there is nothing to be felt either in the rectum or in the abdomen.

A closer examination of the symptoms reveals the fact that in the majority of instances they are materially affected by the situation of the intussusception and the completeness of the obstruction. In both the enteric and ileo-colic varieties the tumour is usually small, and in the former may be so buried in the abdominal cavity among other coils that it cannot be felt. Further, in both varieties tenesmus is an unlikely symptom; and the presence of bloody mucus, even suppose blood be thrown out from the intussusceptum, is not likely to be recognised, should such be passed *per rectum*.

The two symptoms, tenesmus and the passage of blood and mucus, are met with most prominently in cases where

the intussusceptum has descended into the sigmoid flexure or rectum. Here the sense to the patient of something distending the lower bowel evokes persistent efforts for its expulsion; and the nearness of the tumour to the anus allows of the unaltered blood being recognised.

The completeness of the obstruction determines the mode of onset and the character and persistency of the pain and vomiting. When the bowel is completely, or almost completely, obstructed at the outset, the seizure is sudden, the pain is acute, and vomiting soon sets in and persists. On the other hand, if not complete, the pain, at first slight, becomes paroxysmal in character; vomiting is infrequent, but increases, like the other symptoms, as the lumen of the bowel becomes closed.

It is unusual to meet with either tenderness or distension of the abdomen; when they do appear they indicate commencing peritonitis.

The ileo-cæcal variety gives rise to the most marked kind of tumour. It is situated usually in the left lumbar and left iliac regions, and conveys to the touch a swelling the shape and consistency of a sausage. During paroxysms of pain it becomes much harder and more prominent. It is always best felt after the abdominal parietes have been completely relaxed by the administration of an anæsthetic. When the tumour descends sufficiently low to be felt by the finger in the rectum, it is said to feel like the cervix uteri. In some cases the intussusceptum passes through the sphincter, so as to project externally; and in some cases, where it does not descend to the extent of extrusion, it frequently causes a patulous condition of the anus.

Incompleteness of obstruction gives rise to the two clinical classes of subacute and chronic cases, the symptoms of which are frequently so vague that they are more than likely to be ascribed to some cause other than the true one.

Patients suffering from subacute or chronic intussusception are liable to be attacked by pain of a periodical and colicky character, accompanied with vomiting and sometimes tenesmus. In the most chronic cases, peristaltic action of the intestines can be observed through the thinned parietes. It occasionally happens that complete obstruction takes place, when all the symptoms become acute. Failing

any such untoward accident, relief may come through a spontaneous separation of the intussusceptum; or the patient will continue to emaciate, and die eventually from progressive exhaustion.

In some cases the progress of a natural cure is suddenly terminated by the onset of acute symptoms indicative of perforation. The patient is seized with acute abdominal pains, becomes collapsed, vomits, and the abdomen soon distends and becomes tender on palpation. The clinical significance of these symptoms is commencing peritonitis, and their explanation perforation of the bowel along the neck of the intussusception. Either ulceration has progressed until a complete communication has become established between the general peritoneal cavity and the interior of the bowel, or the adhesion of the entering to the returning layer has been insufficient to stand the strain placed upon it on separation of the intussusceptum.

Treatment.—While the course to be adopted in the treatment of any case of intussusception must always be considered solely upon the conditions present at the time, still it will simplify the discussion of the subject if some sort of a clinical classification be attempted as an approximate basis for the pursuit of any particular line of treatment.

Cases may be divided into

I. Acute seen within forty-eight hours.
II. Acute not seen till after forty-eight hours.
III. Subacute.
IV. Chronic.

I. **Acute cases seen within forty-eight hours.**—There is always some hope that in cases thus early seen reduction may be effected without laparotomy. One of three measures may therefore be attempted, *abdominal taxis, inflation, or injection.* In every case chloroform should be administered.

Abdominal taxis.—This method, advocated by Jonathan Hutchinson for all early cases of acute obstruction, has not been practised to any very great extent for intussusception. It is, however, a reasonable measure, and worthy of trial for this class of case. For its mode of performance see Operations upon the Intestines.

Inflation.—Distension of the rectum and colon by the forcible introduction of gas has produced successful results.

Injection.—Distension of the bowel with water or oil has been more frequently adopted than distension by inflation, and on the whole with better success.

Both methods of inflation and injection are, however, not devoid of danger. Knaggs* illustrates by eight fatal cases some of these dangers. In seven rupture occurred. In six of these the ages were from 5 to 7 months. In one, only nine ounces of water were injected, "when a rumbling noise was heard in the abdomen." In the eighth case the child became collapsed and convulsed immediately before death.

Failing in any reasonable attempt by one or more of these methods to reduce the bowel, laparotomy should be performed without delay.

For instructions regarding the performance of inflation and injection see Operations upon the Intestines.

Operation.—Few surgeons, I venture to think, with all proper means at their disposal, would prefer to adopt any less radical measure than that of operation. The non-operative methods of treatment are very proper for any man to use who from various circumstances may feel that he should not at once proceed to open the abdomen. To those, however, for whom no such objections can be raised, there is no reason previously to attempt means that are often ineffectual, sometimes deceptive in their effects, and not free from danger. Badly as very young children stand abdominal operation, there is much to encourage laparotomy even in infants only a few months old. (See below, *Laparotomy.*)

II. **Acute cases not seen till after forty-eight hours.**—With the facilities and needful precautions which exist in a hospital, no surgeon would fail to practise immediate laparotomy; but, under less favourable circumstances and surroundings, should time be spent in trying the more conservative measures above described—taxis, inflation, or injection? It is hardly possible to lay down any definite rule, for not only is there the question of time since the onset of the symptoms to be considered, but the condition of the patient. Acute symptoms may have existed for three, four, or more days, and the patient still not be profoundly ill. It would therefore seem quite

* *Lancet*, 1887, vol. i. p. 1125.

justifiable under such circumstances to run whatever risk there might exist and first attempt conservative measures, especially also in the light of the success which has attended cases of six, seven, and nine days' duration of symptoms. Failing, however, success by injection or inflation, the practitioner should exercise no further delay, and proceed at once to operate.

Laparotomy.—The abdomen should be opened in the middle line below the umbilicus, and the intussusception sought for. When found it should be, if possible, delivered through the parietal wound. By gently pushing or squeezing the part at its distant extremity towards its proximal end, coupled with *slight* traction of the invaginated bowel, disinvagination will in most instances be easily effected.

What is to be done if the impacted loop cannot be liberated? To leave it as it is is almost certain death; so that, fatal as have been most cases treated under these conditions, the surgeon must select between excision of the involved part, a lateral anastomosis between the distended bowel above and the collapsed portion below, or the formation of a fæcal fistula or an artificial anus above the intussusception. If excision is selected by reason of the intussusception being sufficiently limited to admit of it, union of the divided ends of the bowel may be effected by the use of Murphy's button, or by adapting Maunsell's method of suture.* The operation of enterectomy should be referred to for these and other methods (see chap. l.). For remarks regarding the preparation of the patient for operation and the treatment of the small bowel if much distented see page 263.

III. **Subacute cases.**—When the symptoms are not urgent, or, if acute at first, shortly subside, subsequently undergoing exacerbations, careful and repeated endeavours

* Nothing, I think, illustrates better the advance which has taken place in bowel surgery within the last few years than the number of successful cases of excision of acute intussusceptions which have been recorded. When writing for my "Treatise," about five years ago, I could only find recorded two successful cases of excision; and up to 1888 Mr. Barker had not been able to obtain one. Now, however, I have collected notes of no fewer than eight cases, all within the last five years.

to reduce the bowel by taxis, inflation or injection may be made without delay. Any very obvious and lasting increase in severity, however, of the symptoms should at once determine operative intervention.

If the administration of opium is admitted as a suitable drug in any case of intestinal obstruction, then its use in this particular class appears particularly advisable. Anything which will quiet the peristaltic action of the bowel is likely to prevent the onset of more acute mischief at the seat of disease. Where therefore no marked urgency exists, and delay seems advisable, some solid opium and belladonna may be administered by the mouth. Further, the stomach may, with advantage, be washed out, and all food should be withheld from the mouth, nourishment being introduced in the form of enemata.

IV. **Chronic cases.**—The treatment of chronic cases consists either in a careful regulation of the bowels, whereby an effort is made to prevent anything like accumulation taking place above the narrowed part; or in relief by operation. The latter means will suggest itself to most surgeons, as operation on this class of chronic cases is far more favourable than in the acute class. Successful excisions have been recorded.

CHAPTER XXXV.

OBSTRUCTION (*continued*). 4. VOLVULUS. 5. STRICTURE.

TWISTING of the small intestine is a comparatively rare cause of obstruction. It is found most frequently involving the lower part of the ileum, and dependent, as an indirect cause, upon some extra length of the mesentery at that particular part. The greater elongation of the mesentery may be of congenital origin, or due to prolonged stretching, the result of an old hernial loop; but, from whatever cause produced, it has the effect of producing an axis around which the bowel may turn.

In most instances a complete turn is effected, usually

from left to right, but any degree between a half-turn and a complete one may take place. In one recorded instance the bowel was twisted several times upon itself. A rare form is where one coil of intestine becomes twisted round another.

In many instances it is impossible to ascribe any direct cause for the bowel becoming twisted; in others, however, a definite exciting cause is found, such, for instance, as a blow upon the abdomen or violent exercise. The rotation of a tumour growing from either the mesentery or the bowel wall has been known to cause a twist. It is quite possible that adhesions by binding down a loop of bowel at any spot may lead to that particular portion becoming twisted. In some cases it would appear that the existence of a gall stone in the bowel has been the cause of rotation. The twisting of a loop of bowel after slipping beneath a band is probably due to the traction of the mesentery.

The effect of torsion upon the vitality of the bowel depends upon the tightness of the twist. In some instances this is so slight that it does little more than obstruct the lumen of the bowel; but on the other hand it may be so serious that it produces an effect similar to strangulation.

Symptoms.—There are no symptoms sufficiently distinctive of volvulus to admit of it being distinguished from obstruction due to other causes. The patient may be seized suddenly with great abdominal pain, vomiting and collapse; or the onset may be more gradual, with vague sensations of intestinal discomfort, colicky pains, constipation, and possibly some abdominal tenderness.

It is probable that the variations in the symptoms are due to the degree of rotation, or, in other words, to the completeness or otherwise of the obstruction resulting from the torsion.

Treatment.—Were it possible to diagnose these cases, probably none would lend themselves more favourably to treatment by abdominal taxis. The rigorous shaking it involves, together with the manipulation of the abdomen, would very likely untwist the involved loop. Where, however, this measure is either not attempted or fails, none can prove of any avail except laparotomy.

The same rule regarding early operation applies in this class of cases equally with all others of a similar

character. The untwisting of a volvulus before material change has taken place in the affected part is one of the simplest of intra-abdominal operations. All that has been said with reference to gangrenous gut from internal strangulation by bands or other agents applies here, either the part must be excised and an end-to-end or lateral anastomosis effected, or a fæcal fistula or an artificial anus formed.

5. **Stricture.**—In speaking of stricture of the small intestine it must be understood that only such contractions of the calibre of the canal as result from some form of inflammation in the coats of the bowel are included under the term. Stricture from malignant disease, similar to that found in other portions of the alimentary canal, is almost unknown. Narrowing of the canal from external pressure by tumours, abscesses, &c., will be discussed later; while constrictions the result of kinking and twisting have already been dealt with.

The kind of stricture embraced, therefore, under the term is strictly of a cicatricial character, arising in most instances from previous ulceration, and only rarely from a chronic inflammatory infiltration of the intestinal walls, of a character similar to the gonorrhœal stricture of the urethra.

Two forms of ulcer met with in the small intestine have already been described, the typhoid and the tubercular. The former only very rarely gives rise to stenosis in the process of healing.

Tubercular ulceration, on the other hand, affords numerous instances, and is indeed a most fruitful source of stricture. Both from the pathological course which these ulcers pursue, and the frequency with which they are met, there is every reason to expect that they should frequently give rise to stenosis.

As already described, the tendency of a tubercular ulcer is to extend circumferentially—that is, its course round the bowel renders the subsequent process of healing most effectual in the production of stricture. The seat of the stricture, like the ulcer, is most commonly in the lower part of the ileum, although it may be found in any part of the small intestine. The condition is most often met with in persons between 20 and 30 years of age, and most frequently in those who suffer from tubercular lesions in other parts.

While the cause of the symptoms may be one particular stricture, others may exist which are incapable of obstructing to any appreciable extent the normal passage.

One of the most unmistakable evidences, from a pathological aspect, that a particular stricture is of tubercular origin, is the existence of miliary tubercles infiltrating the intestinal walls in the immediate neighbourhood of the lesion.

Syphilis is another cause of stricture. According to Rieder, the lesions productive of obstruction are most frequently met with in the upper part of the small intestine. This lesion appears to consist in an increase of the connective tissue, at first in the submucosa, and later in the other coats.

Another comparatively infrequent source of stricture is the injury which a loop of bowel may receive when strangulated in one of the usual abdominal apertures (see Fig. 45). Several cases have been recorded where, after a certain period has elapsed from the time of performing herniotomy, symptoms of obstruction set in. When a loop of intestine becomes nipped at one of the rings, the part most liable to suffer is the mucous membrane. It is well known that ulceration may take place here, while very little mischief to the external serous coat is visible. The injury, however, may be of a more extensive kind, involving all the coats; so that although perforation may not take place, yet the damage to the bowel may be sufficiently great to cause some sloughing of the whole wall, which will necessarily lead to a considerable formation of cicatricial tissue in the process of repair.

The cases recorded are too few to admit of any statement regarding the relative frequency of stenosis after either inguinal or femoral hernia. The period at which symptoms of stricture appear after the accident of strangulation apparently varies considerably. In one recorded instance they commenced five days after the hernia was reduced; while in another it was nine weeks.

Still rarer causes of stricture are such as arise from some form of traumatism. Thus a foreign body becoming impacted gives rise to ulceration, and this, if repair subsequently takes place, may lead to stricture. A blow on the abdomen, causing contusion of the intestine, may give rise



FIG. 45.—STRICTURE OF SMALL INTESTINE, the result of a strangulated hernia, operated upon eight months previously. A piece of whalebone above the stricture passes through a perforation which occurred during life. (*W.I.M., Glas.*)

to some chronic inflammatory mischief which ends in a narrowing of the canal.

Frequently in cases of so-called simple stricture it is not possible to ascribe any definite cause. It is more than likely, however, that some ulceration insufficient to cause symptoms has preceded the formation of cicatricial tissue. Whether chronic enteritis, like chronic urethritis, can cause stricture is unknown.

As a last cause of stricture, brief reference may be made to that which apparently owes its origin to some congenital defect, either the result of disease during fœtal life or of some malformation. A congenital origin of a stricture is probable in cases where the symptoms develop early.

The nature of the stricture and its pathological sequels.— The kind of stricture is mostly determined by the character of the ulcer which preceded it. The deeper and wider the process of ulceration, and the more completely circumferential its extent, the more seriously obstructive becomes the subsequent cicatrix. In some instances the stricture is so narrow in its longitudinal involvement of the bowel, that externally it has the appearance as if constricted by a string tied tightly around it. In other cases an inch or more of the calibre of the canal is narrowed.

The effect of obstruction at any point is to cause dilatation of the canal above, and hypertrophy of its muscular walls. These changes are most marked in the immediate neighbourhood of the contraction, becoming less so as the more distant parts are reached. In most cases the dilatation is uniform; in others, however, a pouch or saccule is formed in which, either as a cause or as a consequence, a foreign body such as a fruit stone is frequently found. The mucous membrane above the stricture is often found ulcerated, and should the patient live long enough and the process of ulceration continue, there is the possibility of perforation, with its various complications of adhesions, abscesses, fistulæ, or more extensive inflammation.

Symptoms.— From whatever cause produced, the symptoms connected with stricture of the bowel are much the same. Differences will naturally exist in the early history of the case, as for instance where tubercular ulceration has been the cause of antecedent diarrhœa; or strangulated hernia existed; or some injury has been

received; but when once cicatricial contraction has definitely set in, the symptoms in every case become practically indistinguishable.

The onset of the symptoms varies. In some cases the progress of the disease is marked simply by a vague sense of intestinal discomfort with slight pains which come and go; with loss of flesh, and increasing weakness. In other cases the earliest symptoms of intestinal trouble are those indicative of acute obstruction.

The symptoms therefore are largely dependent upon the amount of obstruction to which the stricture gives rise. When symptoms manifest themselves at a period prior to any marked contraction of the calibre of the canal, they usually arise from some temporary blockage of the passage. In such cases the patient is seized with vomiting and griping pain, which soon disappears as the temporary obstacle is passed on. These attacks, however, reappear, and with increasing frequency as the stricture contracts and the canal becomes narrower in calibre.

This temporary blocking of the canal at an early stage of the disease usually owes its origin to the existence of some indigestible material in the bowel—such for instance as fruit stones, fruit skins, &c.—or to a too solid condition of the fæces. It not infrequently happens that the patient becomes conscious of the fact that any indiscretion in diet, or the consumption of certain indigestible substances, is certain to be followed in the course of a few days by the onset of an attack; and, on the other hand, a careful selection of foods retards the frequency with which these attacks of griping pains recur.

The early attacks may be short, but as the tightness of the stricture increases they become prolonged. The pains become more acute in character, and resemble severe attacks of colic. Unless relief soon follows, the abdomen begins to distend, and the peristaltic movements of the bowel may become visible through the parietes, especially during the paroxysms of pain. Persistence of the obstruction leads to all the symptoms which usually follow upon complete obstruction arising from other causes.

The condition of the bowels varies; in many instances there is constipation, in others the motions are loose. The abdomen is not usually painful on palpation, but a

sense of gurgling is often detected both by the ear and the hand.

If death is not brought about by an acute attack of obstruction which remains unrelieved, it usually results sooner or later from emaciation and exhaustion. Such possible complications as perforation above the seat of stricture may cause death at any period of the disease from acute peritonitis.

There are cases where no symptoms have existed prior to those associated with a sudden and complete blockage of the strictured part. In these cases the symptoms are similar to those met with in other cases of acute obstruction, and become, therefore, indistinguishable from such as result from internal strangulation, volvulus, and other similar causes. Sudden pain sets in, which, while more or less continuous, is frequently increased by paroxysmal attacks: vomiting proves incessant, becoming feculent in the course of a few days: neither fæces nor flatus is passed: meteorism soon makes its appearance; and death ensues usually within a week.

These acute cases owe their origin to the same cause which gives rise to slight and temporary attacks in cases where the stricture has not become specially tight. Instead of the foreign body or the mass of fæces becoming loosened, dislodged, and passed, it remains impacted and permanently blocks the narrowed passage.

It occasionally happens that the patient is suddenly relieved by the passage of a copious motion. If after such relief acute symptoms immediately set in, the probability is that perforation of the bowel above the seat of stricture has taken place. Without, however, the sudden onset of such grave symptoms, it may be assumed that some portion of the obstruction has given way and allowed the block to be dislodged and passed on.

Treatment.—The organic nature of the obstruction renders any conservative measures useless, when treatment is considered from a curative point of view. It is possible, however, to give considerable relief in many cases by a careful regulation of the diet. It has already been stated that patients themselves frequently find that certain foods, especially those of an indigestible nature, are liable in the course of a few hours after ingestion to provoke an attack

of pain and vomiting. Hence such indications should be taken as a good guide regarding the conservative treatment to be followed out.

When, however, symptoms of complete and permanent obstruction manifest themselves, little or no hope can be looked for by delay.

The simplest and in one sense the safest operative measure the surgeon can adopt is merely to relieve the distended bowel by making an abdominal incision and opening the first distended loop which presents. The establishment of a fæcal fistula will, if the bowel has not lost its contractile power through prolonged over-distension, end in the copious ejection of its contents, with immediate relief to the patient's sufferings. This measure, however, can only be considered temporary, and a subsequent operation will be necessary to deal with the stricture.

Two ways of dealing with the stricture have been successfully carried out. The most radical is to excise it and unite the ends of the divided bowel. With a Murphy's button, this can be rapidly executed. The second method is to perform "enteroplasty"; the stricture is divided longitudinally and the edges of the incision united transversely.

The rapidity with which either of these methods can be carried out renders them possible as primary measures after opening the abdomen in the middle line, below the umbilicus. If for any reason the means are not at the surgeon's disposal to render the operation a rapid and safe one, he will be wiser to defer the radical treatment of the stricture for a secondary operation, and be satisfied with a fæcal fistula for the time being. For other details possibly necessary in the efficient treatment of the distended intestine and the peritoneal cavity, see page 163.

The usual after treatment should be adopted, nutrient enemata taking the place of nourishment by the mouth for the first few days.

CHAPTER XXXVI.

OBSTRUCTION (*continued*). 6. GALL-STONES. INTESTINAL CONCRETIONS.

THESE occasional contents of the bowel have already been briefly alluded to under the heading of "Foreign bodies," which in a sense they practically are. But there are many points about them sufficiently distinctive to render a separate consideration necessary.

Gall-stones.—Disease the result of gall-stones in the intestine more frequently occurs in females than in males, in the proportion of four to one, and rarely manifests itself before middle age.

The stone finds its way into the bowel either by the common bile duct or by ulceration into the third part of the duodenum, usually direct from the fundus of the gall bladder. Probably in the majority of instances where intestinal mischief is subsequently set up, the stone has been too large to pass by the duct, and has found its way into the bowel direct by ulceration.

Mayo Robson* has classed under four heads the ways in which gall-stones may give rise to obstruction.

(1) The paralytic form, dependent on local peritonitis in the region of the gall bladder.

(2) Volvulus of the small intestine dependent either on the violence of the colic caused by an attack of cholelithiasis, or on the contortions induced by the passage of a large concretion through the small intestine.

(3) Mechanical obstruction due to the passage of a large concretion through the small intestine.

(4) Obstruction depending on adhesions or on stricture the result of past gall-stone attacks, or of healing fistulæ.

The form of obstruction most frequently met with is that classed as (3). The obstruction is mechanical, and due to the blocking of the bowel at some point by the gall-stone becoming impacted. The neighbourhood of the ileo-cæcal

* *Brit. Med. Journ.*, 1895, vol. i. p. 194.

valve in the ileum is the most common seat of obstruction.

The stone which becomes impacted is usually a large one, but size does not appear to be the sole determining factor, for stones quite as large as any which have caused serious symptoms have been passed without material trouble. It is possible that in not a few instances either the state of the contents of the bowel or sluggishness in its peristaltic action causes the calculus to become coated with fæcal concretion, and hence its size so augmented that obstruction ensues. It is often found that the stone, when passed or removed by operation, is surrounded with a considerable quantity of fæcal material.

Symptoms.—Obstruction from gall-stones adds still another cause to the many which give rise to acute symptoms without often indicating the true nature of the cause.

In the cases which fall under the first heading of Mayo Robson's classification there will be, in addition to the symptoms of acute obstruction, pain and tenderness about the region of the gall bladder, due to the local peritonitis set up in that part.

In the more frequently met with class of cases of mechanical obstruction, the symptoms may commence suddenly and in a way quite similar to acute obstruction from other causes. The patient while in perfect health is suddenly seized with violent abdominal pain, vomits incessantly, and passes neither flatus nor fæces. The vomit, at first bilious, becomes in the course of a few days fæcal. The patient soon shows the characteristic, drawn, sunken, anxious face. The abdomen, not tender or distended at first, may become so. A dry tongue with parched mouth, and thirst causes much distress; and if the obstruction is to prove fatal, peritonitis may supervene and the patient die of exhaustion.

The early history of the case sometimes affords a clue to diagnosis in these cases of obstruction. Thus the patient may have had previous attacks of biliary colic accompanied with jaundice and the passage of gall-stones; or there may have been some tenderness and pain in the region of the gall bladder, due to the process of ulceration taking place there while the stone found its way into the duodenum. In very many cases, however, no such history will be forth-

coming, for large stones will sometimes pass directly from the gall bladder into the duodenum without causing any manifest disturbance.

In some cases gall-stones remain for a considerable time in the bowel, giving rise to intermittent attacks of obstruction, and producing symptoms suggestive of stricture.

Physical examination of the abdomen does not usually afford much information. It is possible sometimes, however, with the patient under an anæsthetic, to feel the stone.

Prognosis.—Possibly there is no cause which gives rise to typical symptoms of acute obstruction that can be considered so hopeful in its ultimate issue as that of an impacted gall-stone. The most severe symptoms may manifest themselves, but these may completely subside, the patient pass the gall-stone *per anum*, and perfect recovery ensue. Numerous cases are reported in proof of this.

While, however, there is the possibility of recovery, there is the greater probability of death. Thus out of twenty recorded cases where definite and severe symptoms of obstruction existed, six recovered and fourteen died.

Unfortunately there are no symptoms which enable one to state in any case whether or not the stone will move on. It is always reasonable to entertain the hope of nature effecting a cure unaided; but the great difficulty is to say how long such a hope is to be entertained: how long, in short, should the symptoms be allowed to continue before operative intervention is permitted.

Treatment.—If operation be not decided upon then the following measures should be adopted. An anæsthetic should be given, large quantities of fluid injected into the rectum and colon, and abdominal taxis practised.

Belladonna and opium should be administered, all nourishment withheld from the stomach, and the patient kept at rest.

In almost every instance the stone at an early stage of the attack is capable of being dislodged from its seat. It is always possible therefore that these measures may prove sufficient, and within a short time of their performance the patient may pass flatus and later a copious stool. The stone occasionally gets stopped just above the sphincter, and gives rise to considerable inconvenience and pain in its final ejection through the anus.

Should these measures fail to give relief, the question of further delay or the immediate performance of enterotomy has to be considered.

By contrasting the percentage recoveries in two sets of statistics it is seen that where no operation was performed there were 30 per cent., and where operated upon, 50 per cent. in one list and 30·4 per cent. in the other. It is quite possible that these statistics are very fairly comparable, because in both instances of operation and non-operation it is much more likely that natural recoveries and recoveries after operation would be published than the deaths attributable either to the one or to the other. The difference, however, cannot be considered sufficiently great to settle the question in favour either of delay or operation.

Irrespective of statistics, cogent factors which need to be taken into account in any endeavour to decide upon the proper course to pursue are the circumstances attending the immediate surroundings of the patient. Where nature is left to her own unaided efforts, the case of hospital patients would be practically the same as that of patients in their own private homes. The conditions, however, would be markedly different in the case of operations performed in these respective places. Herein therefore probably exists the solution of the difficulty. If the conditions are such as will permit of the operation being performed with all the most approved requisites, and by one sufficiently experienced, then there can be but little doubt that the best results will, on the whole, be attained by the performance of enterotomy. Failing, however, both these essentials, the practitioner will act more wisely in refraining from operation.

As a purely clinical consideration it must be remembered that these cases are likely to come before us simply as ones of intestinal obstruction in which we have no knowledge of the cause, so that immediate laparotomy will in most cases be the right course to pursue.

Operation.—In performing entero-lithotomy, the usual precautions must be taken in the preliminary process of opening the abdomen. The parietal incision should be in the middle line, below the umbilicus.

The lower part of the ileum should first be sought for as being the probable seat of the calculus. When found, an endeavour should be made by gentle external manipulation

to squeeze the stone on, and if possible get it through the ileo-cæcal valve into the cæcum. If it can be thus dislodged, nothing further remains to be done except to close the abdomen.

If the stone cannot be displaced, the bowel should, if possible, be drawn out of the abdomen and incised in a longitudinal direction over the stone, and the latter extracted. Prior to opening the bowel every possible precaution must be taken, by the proper application around of sponge cloths, &c., to prevent any contamination of the peritoneum by the contents of the intestine. In many instances death has resulted from septic peritonitis.

After the stone is withdrawn, the opportunity should be taken, when the opening in the gut affords, of allowing the escape of any fæces or flatus which may be overdistending the bowel above. The edges of the mucous membrane should then be stitched together by a continuous suture, and the external coats united by a series of Lembert stitches. Should there be any suspicion of escape of fæcal material into the peritoneal cavity, it should be freely flushed with hot normal saline solution before closing the parietal wound.

As possible contingencies to be encountered and dealt with, the surgeon may have to consider the propriety of excising the area of impaction or stitching the bowel orifice to the abdominal wound and so forming a temporary fæcal fistula. One of these courses must be pursued when, from ulceration or other damage to the bowel wall at the seat of impaction, the parts are not in a condition to be safely stitched up and returned. Adhesions may have to be separated; and the twisting of a coil undone which, as already pointed out, is sometimes associated with a gall-stone.

Intestinal concretions or enteroliths.—It is rarely that these form or collect in the small intestine sufficiently to give rise to obstruction. They are much more frequently met with in the large bowel. When present in the former, they are usually found about the lower end of the ileum. The probable way in which many of these calculi are formed is by the free and prolonged use of some salt or mineral substance, such, for instance, as lime and magnesium, and by drinking water containing chalybeates in the form of carbonate of iron.

CHAPTER XXXVII.

OBSTRUCTION (*continued*). 7. TUMOURS OF THE BOWEL WALL. INNOCENT AND MALIGNANT.

NEITHER the jejunum nor the ileum is a frequent seat for the development of new growths. Such as do arise affect mostly the internal coats, and by their increase in size tend to obstruct the canal; those that produce symptoms are mostly solitary, but the intestine has been found studded with polypi, and cysts of minute size, in patients dying from other causes. It is usual to consider these neoplasms under the common classification of innocent and malignant.

Innocent.—*Fibromata.*—Tumours composed chiefly of fibrous tissue develop in the submucous coat and then project into the canal, forming one of the kinds of polypus which are occasionally met with in the small intestine. Intestinal polypi are most frequently met with in the lowest part of the ileum, hardly ever in the upper part, and only occasionally in the jejunum. Taking the intestine as a whole, their commonest seat is in the rectum, where they will be again referred to.

Myomata.—These tumours composed partly of unstriped muscle tissue, arise from the muscular coat of the bowel, and usually take the form of polypus.

Adenomata.—These tumours, glandular in structure, arise from Lieberkühn's follicles. Like the two preceding, they form polypi which project into the bowel.

Lipomata.—Fatty tumours are sometimes found. They develop in the submucous tissue, and are frequently multiple. They rarely cause obstruction.

Cysts.—These probably constitute the rarest kind of tumour met with in the small intestine. In a case which was admitted into my wards, the patient, an old man of about seventy years, was suffering from acute intestinal obstruction. On opening the abdomen an intussusception was found; its irreducibility determined me to excise it. When subsequently examining the excised segment, I found

that the ileum contained a sessile cyst about the size of a walnut with a turbid viscid fluid within it. The cyst formed the apex of an ileac intussusception at the lower part of the ileum. Improvement followed the operation, but the patient died a few days later from exhaustion.

Nævoid growths.—These, like the preceding, have been met with, but are very uncommon.

The various kinds of innocent tumours do not give rise to any symptoms whereby they may be diagnosed. If they cause obstruction it may either be of an acute or a chronic character. Those which form polypi not infrequently induce intussusception. In such cases it is usual to find the polypus at the apex of the intussusceptum.

A class of innocent tumours has already been referred to (see page 146) which, solid in their structure and often malignant in their clinical features, possess the peculiar faculty of disappearing. They are spoken of more generally as solid tumours of the abdomen which spontaneously disappear. Their actual connections are unknown, but they appear in some cases to be intimately connected with, or, at least, adherent to, the intestines. They are usually ascribed to inflammation, although the evidences are not always in support of such an explanation. Greig Smith,* who has carefully considered the possible origin of these tumours, arrives at the following conclusion: "They are simply aggregations of embryonic cells and tissues, heaped up around an intestinal perforation. The perforation is minute and the amount of escaping fluid is small, so that the cells can effectively deal with it. The perforation remains open for a long period of time, and the continued demand for new cells results in an aggregation which is practically a tumour."

The symptoms to which these tumours give rise are often of an obstructive character.

Malignant tumours.—Cancer, whether in the form of carcinoma or sarcoma, is a comparatively rare disease of the small intestine. Nevertheless unmistakable cases occur, which prove that the bowel may be affected both primarily and secondarily.

Carcinoma.—The lining cells of the mucous membrane

* *Trans. Roy. Med.-Chir. Soc. Lond.* 1894, vol. lxxvii. p. 139.

are of the columnar type of epithelium. Hence, as would naturally be expected, columnar-celled carcinoma or epithelioma is the form most frequently met with.

The cases are too few to admit of any comparison as regards relative frequency in one portion of the canal as compared with another. Such cases as I have been able to find reported show that carcinoma may occur at any part.

Whether the disease commences as a nodule beneath the mucous membrane, or as a plaque on the surface, its progress is usually round the bowel, so that sooner or later a circular constriction results, with all the attendant ills of gradual obstruction to the onward passage of fæces. The constriction may be so tight that the affected portion appears as if encircled by a piece of string. In addition to the growth inwards which narrows the canal, the intestinal coats are sometimes greatly thickened by the infiltrating growth of the tumour. A certain amount of ulceration takes place on the surface of the growth internally.

When once constriction has become a marked feature in the case, other changes ensue in the part of the bowel above. These have already been fully referred to in discussing cicatricial stricture, and being quite similar need not be repeated here. (See page 286.)

Secondary deposits are occasionally found infiltrating the intestinal wall. These secondary tumours, however, are not prone to produce any obstructive symptoms.

Symptoms.—There is little, if anything, which can be said to distinguish the symptoms of carcinomatous stricture from those which follow upon stricture from any other cause, with the one possible exception that in some instances a tumour may be felt through the abdominal parietes.

Treatment.—The treatment of stricture from carcinoma resembles in all respects stricture due to other causes; either the distended bowel above should be opened and a fæcal fistula formed to afford temporary relief, or the more radical measure of enterectomy should be performed.

Sarcoma.—Sarcoma, like carcinoma of the small intestine, is a comparatively rare disease. It is equally fatal in character, but possesses differences in its mode of involvement of the bowel, and in the symptoms to which it gives rise.

Sarcoma affects the bowel in two forms. In the first it resembles the fibromata, adenomata, and myomata in grow-

ing in the shape of a polypus and projecting into the canal; in the second it extends around the wall, thickening it and at the same time widening the channel. In the polypoid form it is usually of the spindle-celled variety of sarcoma; in the other it is the round-cell d.

Primary sarcoma arises generally in the submucous coat. When the coats are invaded from disease of the mesenteric glands, it should be considered secondary involvement, not primary disease of the bowel.

As the growth proceeds it infiltrates all the coats with the exception of the serous, which is but rarely involved. The effect of the infiltration is to produce great thickening, which in some instances leads to increase in the normal calibre of the canal, but in others to encroachment, so that the bowel becomes almost stenosed. In cases where the tumour mass is very large, and involves also the mesentery, the origin of the tumour may be open to some doubt, as there is as much probability that it may have arisen in the mesenteric glands as in the submucous tissue of the bowel.

Sarcoma is most frequently met with during the third and fourth decades of life.

Symptoms.—It often happens that general or constitutional symptoms manifest themselves for some time prior to the appearance of local evidences of disease. Thus there is progressive emaciation, loss of appetite, and loss of strength. The patient has a sallow complexion and is cachectic. Local symptoms show themselves by gastric troubles, with ill-defined pain in the abdomen. The bowels become irregular, at one time constipated, at another loose, or they may remain unaffected. In cases where the tumour gives rise to constriction and narrowing of the canal there may be repeated attacks of obstruction, gradually increasing in severity. In most instances palpation of the abdomen will reveal the presence of a tumour. It would seem that in some cases the tumour, for some unaccountable reason, may disappear for a time. It is possible that such disappearance is only delusive: that the bowel has altered its position or been overlapped by other coils distended with gas.

The course of the disease is usually rapid. In most cases death follows in about nine months from the commencement of the symptoms.

Treatment.—Removal of the affected part can alone be of any service. This, however, can only be effected in the early stage of the disease, when the tumour has not by direct extension become adherent to and infiltrated other parts.

Lymphoma, Lymphadenoma.—This kind of tumour practically belongs to the class of sarcomata, and probably in many instances is described as such. In structure it consists of very small round cells contained in the meshes of a delicate network of fibrils.

When arising in the bowel wall, the tumour causes changes indistinguishable from those which have been just described in the case of sarcoma. The lumen of the canal may be increased. The tumour may form a considerable mass, and does not tend to degenerate.

CHAPTER XXXVIII.

OBSTRUCTION (*continued*). 8. EXTERNAL PRESSURE. 9. PERITONITIS. 10. CONGENITAL ABNORMALITIES, MALDEVELOPMENTS. NEUROSES.

8. **Pressure upon the small and large intestine from without.**—Pressure upon the bowel in order to produce symptoms must narrow its lumen, and the diminution so effected results in obstruction. Two factors of primary importance in the production of obstruction by external pressure are immobility of the bowel and counter resistance. Hence it is found that the upper part of the jejunum and the duodenum, the cæcum, the sigmoid flexure, and the rectum, being the parts most fixed and most protected around by resistant bony and cartilaginous walls, are the regions of the intestinal canal usually obstructed from external pressure by tumours and other swellings.

Tumours arising within the pelvic cavity are specially prone to produce pressure on the rectum. Numerous

examples of such tumours are found in connection with the uterus and ovary.

In some instances a tumour, when of a malignant nature, tends not only to obstruct by pressure, but invades also the walls of the gut. It has been indicated how sarcoma arising within mesenteric glands is liable to extend to the bowel, press upon the canal and invade its coats.

Solid tumours arising from any organ within the abdomen are more liable to produce pressure than cysts or abscesses. Nevertheless, examples of the latter are met with, several cases where cysts of the mesentery had caused obstruction having been recorded.

Symptoms.—It is unusual for symptoms of obstruction to arise from external pressure without its being known that a swelling or tumour liable to produce such obstruction exists. In other words, before a tumour is likely to produce pressure sufficiently great to cause obstruction, it will have rendered its existence perceptible either to the eye or to the hand. The diagnosis therefore of the true cause is frequently not difficult. Although the obstruction may be complete, the symptoms are not ushered in with the same degree of acuteness as is the case in many other forms of obstruction; nor throughout their course are they so urgent. Pain is chiefly paroxysmal and not severe. Vomiting is not incessant. There is abdominal distension with possibly visible peristalsis. The intermittency of the symptoms, especially at the outset, is due to the fact that the increased *vis a tergo* occasionally somewhat overcomes the external pressure, so that some temporary relief is obtained. The more persistent and urgent the symptoms the more complete must the obstruction be considered.

Treatment.—Removal of the cause of pressure will in most instances be followed by relief of the symptoms. When, however, the gut has been invaded or become inseparably adherent, it will be necessary to remove the part concerned at the same time. In the case of cysts producing pressure, if their excision is not possible, they should be tapped, and the opening stitched to the parietal wound for drainage.

9. **Peritonitis.**—Inflammation affecting the bowel from without, as in the case of peritonitis, leads to obstruction.

As Wilks tersely expresses it, "an inflamed bowel is a paralysed bowel," and a paralysed segment of bowel acts as an effectual barrier to the onward progress of its contents.

When obstruction arises from peritonitis, the cause itself is sufficiently grave to mask the prominence of symptoms which owe their origin directly to the obstruction. It would, however, be quite correct to say that the symptoms of obstruction are those of peritonitis; and for that reason it frequently becomes a matter of great difficulty in diagnosis to determine in certain cases whether we are dealing with peritonitis as a primary disease or with obstruction from some mechanical cause.

The symptoms of uncomplicated peritonitis need not be entered upon at any great length here; in most respects they resemble those which have already been frequently alluded to as occurring in peritonitis the result of injuries and diseases of the intestines. Most prominently stands out the pain which is felt, frequently first at the lower part of the abdomen, although no region is exempt from it even at the outset. It may be of a pinching, aching, burning, or cutting character, and is increased by pressure or by movement. The patient's attitude with regard to the pain is somewhat characteristic. If moving about or sitting, he stoops; if in bed he lies on his back with his head and shoulders raised and his knees and thighs flexed. Every effort is made to relax the abdominal parietes and protect the parts from pressure. The abdominal muscles become fixed, and any attempt to palpate the part increases the rigidity. There is usually some fever, with all the various concomitants which generally attend rise of temperature. Vomiting and hiccough are frequently present.

Peritonitis, as frequently pointed out, is extremely variable in its symptoms. The exact converse of one case may be found in another. Temperature, in place of being high, may be low: instead of a hot flushed face, pallor with cold perspiration: in place of a rigid abdomen, a lax one with little or no pain; while the bowels instead of being confined are loose, with an approach in some cases to diarrhœa. In many instances the symptoms are those of septic poisoning.

Treatment.—Uncomplicated peritonitis—that is to say, peritonitis unconnected with some disease or injury to the

intra-abdominal viscera—rarely comes under the hands of the surgeon for treatment. It is questionable, however, whether acute peritonitis from whatever cause should receive treatment other than that which may be considered purely operative. While it may be quite true that cases will recover under purgatives, opium, hot poultices or hot fomentations, it is equally certain that a far larger proportion will succumb unless the abdomen is opened and the peritoneal cavity cleansed.

The course to be pursued after opening the abdomen will depend upon the nature and extent of the peritonitis present. For practical purposes we may divide the cases into those where the peritonitis is more or less limited or localised, and those where it is general, subdividing the latter again into an adhesive and an infiltrative form.

Limited or localised peritonitis.—In most of these cases it will be found sufficient to wipe away the inflammatory exudation, and any possibly extravasated material from a perforation.

Adhesive peritonitis.—Why the peritoneum should in some cases produce a form of inflammation which results in an intimate glueing of the coils together, while in others they are perfectly free, it is impossible to say. Perhaps the rapidity with which the effusion takes place may have something to do with it. Whatever the cause, however, this adhesive form is one of the most difficult to deal with. It is seen, strangely enough, in some of the most virulent cases and in some of the slightest. In the former the wet wash-leather-like exudate has here and there small foci of pus. These are some of the most hopeless cases we have to deal with, and whether we simply separate the engaged coils and freely flush the peritoneal cavity, or after separation wipe away the pus and endeavour to strip off the leathery plaques from the bowel wall, it is rarely that we succeed in getting a successful result. As, however, every degree of severity exists in this particular class, we may hope occasionally to succeed by adopting one or other of the methods described.

When the adhesions do not contain purulent material and there is no cause left, so far as can be ascertained, to excite a continuance of the inflammatory process, it is quite possible that we are dealing in many instances with a

natural process of repair; the material which glues the inflamed coils together being in a sense nature's form of bowel callous. It is frequently found that this form of "callous" is so intimately adherent to the bowel wall that it cannot be stripped off, and when it is, the surfaces often bleed. In cases of this class it is doubtful whether we should make any attempt to disturb the coils. There is ample evidence to show, from cases of pelvic peritonitis, that this form of adhesion may become ultimately entirely absorbed and the bowels completely freed again.

Infiltrative peritonitis.—In this particular class of cases there is a general infiltration of the peritoneal cavity with sero-purulent material, containing free flaques of lymph, and in case of perforation, material which has escaped from the perforated organ or a burst cyst or abscess. Coils of intestines may be glued together here and there, but there is not the same general and firm adhesion as seen in the preceding class of cases.

There is no doubt of the proper course to pursue in the treatment of these cases. After efficiently dealing with the cause, the whole peritoneal cavity should be freely and methodically flushed with hot normal saline solution (one teaspoonful of common salt to a pint of water at about 110° F.) I prefer in treating these cases to "exventrate" the intestines, that is to say, to lift them as much as possible out of the wound, and so see that the whole pelvic cavity is properly cleansed. The soft rubber irrigating tube is also passed well up to the diaphragm, in front and behind the liver. The intestines are also freely washed as they lie on the abdomen before being returned into the peritoneal cavity. After replacing the bowel no endeavour is made to remove more than just the excess of the saline solution.

If the intestines are much distended and injected, an incision about an inch in length in the long axis of the bowel should be made, and tension relieved. Through this incision, before closing, an ounce of magnesium sulphate in solution may with advantage be introduced into the bowel. (See page 163.)

Occasions may occur where the surgeon may deem it advisable to drain either by a tube, inserted usually well down into the pelvis, or by strips of absorbent tissue. I believe, however, that in all cases where the flushing has been

thoroughly carried out, the parietal wound may be completely closed.

This seems a fitting place to refer to a special portable emergency operating table which I have devised for such abdominal cases as are likely to require free flushing of the peritoneal cavity. Every surgeon knows the great difficulty of efficiently treating these cases in private houses. This table with its appurtenances has been so constructed that when closed and folded it contains the irrigator and the special mackintosh. The former, when the table is erected, is fixed to a standard attached to one of the legs; while the latter drains off the fluid through a hole in the table into a receptacle beneath. The table has been built for me by Messrs. Weissner and Co., surgical instrument makers, Glasgow. (See Figs. 46 and 47.)

10. **Congenital abnormalities, maldevelopments.**—By far the largest number of malformations of the small intestine are connected in some way with the vitelline duct. Either this has remained patent, or its too complete obliteration has resulted in stricture. Between these two extremes there is every grade of maldevelopment.

Hudson * has adopted the following useful classification of malformations based on variations found in the development of the vitelline duct. The cases are divided into two groups.

In the first group are—

(1) Cases in which the ileum opens freely at the umbilicus, and the chief part of the evacuations of the bowel is discharged by this fistula.

(2) Cases with a small fistulous opening at the umbilicus, admitting a probe and occasionally allowing the passage of fæces and flatus.

(3) A tubular prolongation of the ileum, connected with the umbilicus, either directly or by a longer or shorter fibrous cord.

(4) A fibrous cord connecting otherwise normal intestine or mesentery with the umbilicus.

(5) Meckel's diverticulum, of variable length and shape, either terminating in a rounded extremity or hammer-shaped dilatation.

* *Trans. Path. Soc. Lond.* 1889, vol. xl. p. 98.

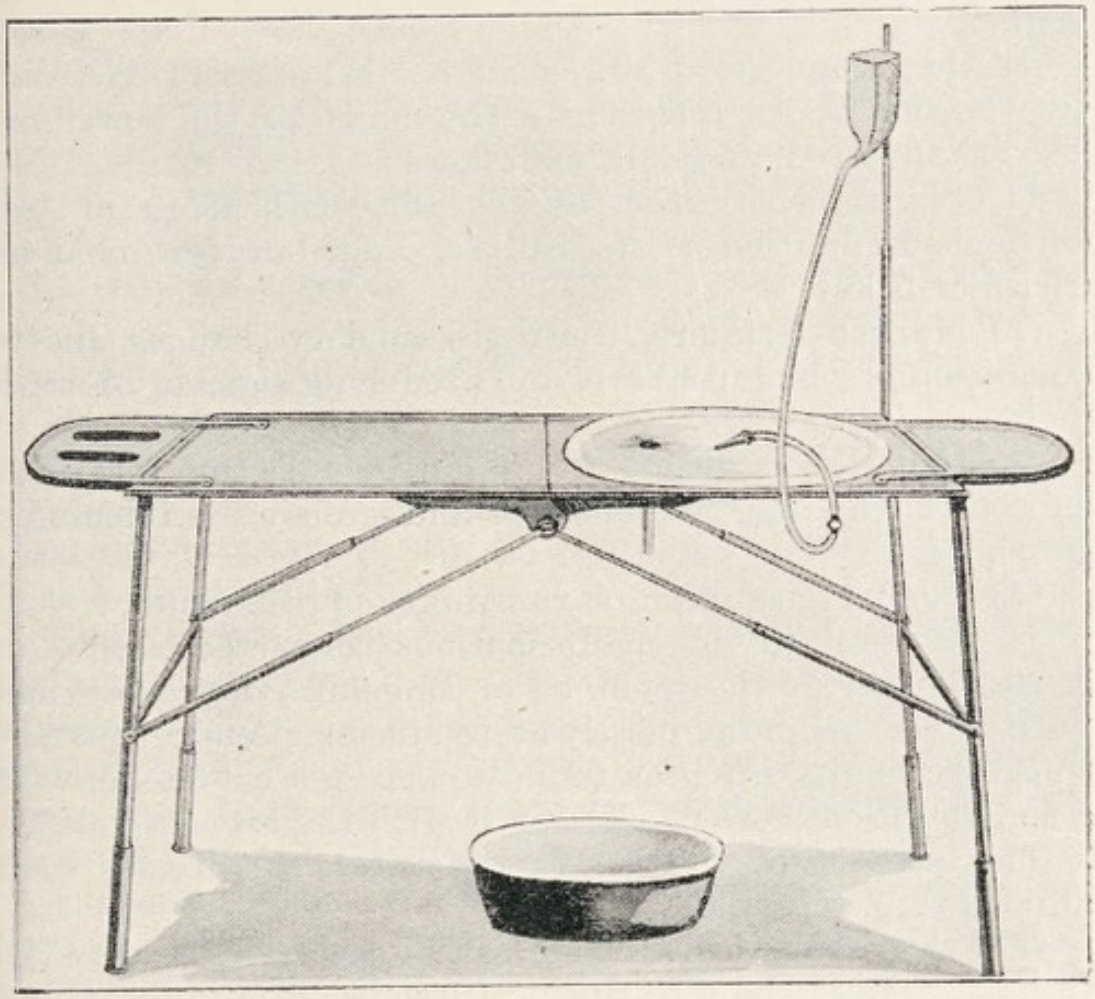


FIG. 46.—Portable emergency operating table, with irrigator and mackintosh arranged for flushing the peritoneal cavity

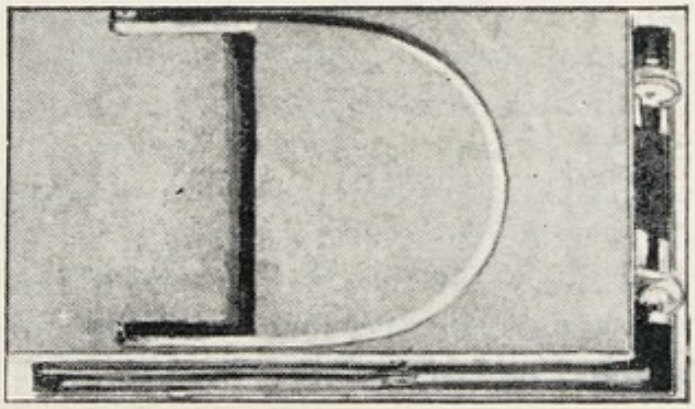


FIG. 47.—Table closed ready for carriage ; containing irrigator tube, and mackintosh.

(6) Slight saccular pouching of the intestine in this region.

In the second group are included instances of excessive obliteration of the duct where the lumen of the bowel has become involved, arranged as follows:

(1) Slight constriction of the gut, with more or less obvious diminution of its calibre, and but few changes above or below.

(2) Marked stricture, causing secondary changes due to dilatation of the gut above, and producing signs of obstruction.

(3) Complete occlusion of the gut by a septum formed of mucous membrane, the muscular and serous coats remaining continuous.

(4) Complete solution of continuity of the ileum.

In addition to the malformations connected with this particular part of the ileum, other congenital defects are met with in the jejunum, mostly at its duodenal end; thus the upper extremity has been found to end in a cul-de-sac, with a simple fibrous cord connecting it with the lower segment.

The subject of congenital stricture has already been alluded to (see page 286).

Of anatomical rather than pathological interest is the transposition of the intestines. (See also Malformations of Large Intestine.)

Symptoms.—Many of these congenital defects are purely of pathological interest, and are found more among the records of the pathologist than of the clinician. On the other hand, cases are sufficiently numerous to show that not infrequently they are a source of grave trouble.

Nothing further need be said here regarding the mode in which a diverticulum or its ligamentous remnant is capable of strangulating a loop of bowel; nor is it necessary to repeat what has already been stated regarding the symptoms connected with congenital stricture.

Complete occlusion of the bowel, such for instance as exists in cases where the proximal extremity ends in a cul-de-sac, gives rise to symptoms shortly after the birth of the child.

At first the child may readily take the breast, but vomiting soon sets in, and it is found that everything taken is returned. Nothing is passed by the bowel except a little

mucus. As a rule it is not easy to mistake the comparatively small quantity of slimy material ejected, for the normal meconium which should be excreted.

Distension of the abdomen is not seen at first, but in the course of a day or two it appears and forms a marked feature in the emaciated condition of other parts of the body.

It is never possible to predict with any degree of certainty in what region of the bowel the occlusion exists, whether in the duodenum, the jejunum, or the ileum.

The number of days which an infant with complete obstruction is likely to live varies, and depends probably more upon the natural vigour and vitality of the child than upon the situation of the obstruction. Life has lasted to as late as the tenth day.

Treatment.—The only possible measure in the treatment of obstruction from occlusion is laparotomy and the formation of an artificial anus. This has been attempted several times; and if it has not been the means of hastening death in so young a patient, it has not yet apparently been successful in prolonging life.

The only other congenital defect which comes under the surgeon's observation and treatment is that associated with incomplete closure of the vitelline duct. As already pointed out, this condition may exist in the extreme form of an abnormal anus at the umbilicus, where practically all the fæces are discharged; or merely as a fistula through which a small quantity of mucus or fæcal matter exudes.

The former, the much graver of the two conditions, will probably need some plastic operation for its cure. There are two advantages, however, in delaying any operative interference. The first is, that young infants do not bear operations well, and the second, that there is the possibility of the aperature closing. If the umbilical orifice has shown distinct evidence of contraction, it may prove possible to complete the occlusion by the application of the actual cautery to its edges. This measure is, however, rarely successful, and a plastic operation of the nature of transplantation of a skin flap may be required.

In cases of the second and less severe kind of fæcal fistula, it frequently happens that evidences of a fistula are not manifest until a few days after birth; that is to say

until the time of usual separation of the cord, about the fifth or sixth day. The orifice of the fistula is then sometimes marked by a little red vascular papilla or polypus, at the base of which a small opening exists, which admits of the insertion of a probe for a variable distance. In not a few instances these fistulæ close in the course of a few days. Should they remain patent the canal may be cauterised, or, if necessary, a plastic operation performed.

Intestinal neuroses.—There occasionally come under the observation of the surgeon cases of intestinal disturbance which appear to have their origin either in some purely mental aberration or in some local nerve irregularly. Among the former are cases of supposed ingestion of a foreign body, when the patient imagines he feels the body within the abdomen. In other instances the patient imagines they have a certain disease, the symptoms of which they have in some way got a knowledge of and will actually exhibit. The symptoms are sometimes very distressing. The patient may complain of acute discomfort and pain, vomit, and refuse food.

In instances of local nerve disturbance a particular segment of bowel, most frequently the sigmoid flexure, undergoes irregular contraction, causing vague and unpleasant sensations in the patient, and sometimes producing tangible evidence of an evanescent tumour, in the affected region.

The symptoms may doubtless in some instances be explained by supposing that the usually imperceptible peristalsis of the bowel becomes consciously observed and felt by the patient, who in many instances is of a highly neurotic temperament.

When these cases are not influenced by medical treatment, laparotomy should be resorted to. Nothing probably will be found, but in some mysterious way the exploratory operation has a beneficial effect, probably by producing a profound mental impression.

SECTION III.

THE LARGE INTESTINE AND APPENDIX VERMIFORMIS.

CHAPTER XXXIX.

ANATOMY AND PHYSIOLOGY.

The large intestine extends from the termination of the ileum in the right iliac region to the anus. It measures from five to six feet in length, and constitutes therefore about one-fifth of the entire length of the intestinal canal. For descriptive purposes it is divided into six separate regions, known respectively as the cæcum, ascending colon, transverse colon, descending colon, sigmoid flexure, and rectum.

The cæcum.—This is a large blind pouch constituting the commencement of the colon. It is generally considered as that portion of the latter which is situated below the level of the ileo-cæcal valve (see Fig. 48). It lies in the right iliac fossa, and measures, in the adult, about two and a half inches both in its vertical and transverse diameters. Posteriorly it rests usually upon the psoas muscle, but if located more externally it lies in contact with the iliacus, or if more internally, on the brim of the pelvis, or even within the pelvic cavity. Separating the muscle from the bowel is the iliac fascia with some fatty and areolar tissue. In front are some coils of the small intestine, but when distended it touches the abdominal wall. The cæcum is entirely surrounded by peritoneum, which admits therefore of a considerable amount of movement of the part. Attached to its lower and hinder part is the vermiform appendix (For a full description of this appendage see later.)

The ascending colon.—Commencing at the cæcum opposite the ileo-cæcal valve, the ascending colon extends upwards to the under surface of the liver, on the right of the gall bladder. It lies in the right lumbar and hypochondriac

regions, resting posteriorly upon the quadratus lumborum below and the kidney and descending part of the duodenum above. In front it has the abdominal parietes with some coils of small intestine, which also lie on its inner side. It is surrounded by peritoneum to a somewhat variable extent. It is frequently completely invested, and in some instances to the extent of possessing a meso-colon.

The transverse colon.—In the continuation of the ascending into the transverse colon a bend is formed beneath the liver, known as the hepatic flexure. From this point the colon passes across the abdomen from the right to the left hypochondriac region. Its central portion lies on a somewhat lower and anterior level, and occupies a position equally in the epigastric and umbilical regions. By its upper surface it is in contact with the liver and the gall bladder, the stomach and the spleen. Below it are coils of the small bowel. In front it has the great omentum and the abdominal parietes, while behind it is the third portion of the duodenum and the meso-colon. It is practically surrounded by peritoneum, and by its meso-colon is rendered the most movable segment of the large bowel.

The descending colon.—As on the opposite side, the transverse colon connects with the descending colon by a sharp bend. This is situated just below the spleen, and is termed the splenic flexure. From this point the bowel takes a course vertically downwards from the left hypochondriac region, through the left lumbar to the left iliac region. Posteriorly it is connected with the left crus of the diaphragm, the left kidney, and the quadratus lumborum. In front it is covered by coils of the small intestine. This part of the bowel is more frequently surrounded by peritoneum than the corresponding ascending portion.

The sigmoid flexure.—This segment of the large bowel occupies the left iliac fossa, and extends from the crest of the ilium to the sacro-iliac articulation, where it terminates in the rectum. It derives its name from its somewhat peculiar looped disposition. It is concealed by small intestine, but when distended comes into contact with the abdominal parietes. It is surrounded by peritoneum, which forms a meso-colon and serves to retain it in position.

The rectum, the remaining portion of the large intestine, will be dealt with separately. (See Part IV.)

Structure.—The large intestine, like the small, has four coats—serous, muscular, cellular or submucous, and mucous.

The *serous coat* consists of the peritoneum and surrounds the various segments of the bowel to the extent already

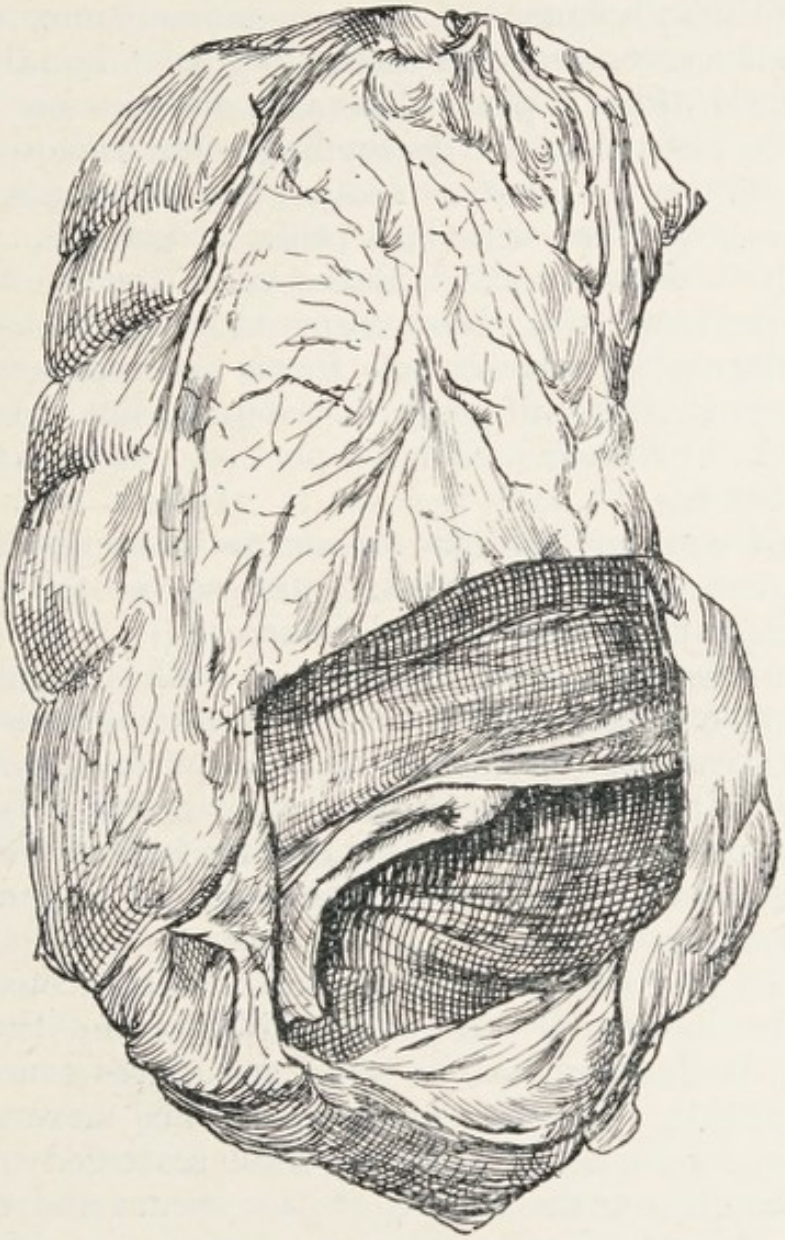


FIG. 48.—ILEO-CÆCAL VALVE. (*R.I.M., Glas.*)

The colon opened to show the normal disposition of the valve.

described. At certain parts, more particularly in the transverse colon, the serous coat is thrown into a number of small pouches filled with fat, called *appendices epiploicæ*.

The *muscular coat* consists of two layers, an external longitudinal and an internal circular. The former, while it

distributes its fibres around the whole circumference, is best marked in the form of three longitudinal flat bands about a quarter to half an inch in width. One, the posterior, is situated along the attached border of the bowel; a second is disposed anteriorly and corresponds along the arch of the colon to the attachment of the great omentum, but lies in front in the ascending and descending colon and the sigmoid flexure; the third is placed laterally, and lies on the inner side of the ascending and descending colon and on the under border of the transverse colon. The shortness of these bands, as compared with the other structures, serves to throw the canal into a sacculated condition, so that when divided the bowel straightens out into a uniform channel.

The internal circular muscle forms a comparatively thin layer, more or less uniformly distributed, but thickest and best marked over the sacculated portions between the longitudinal bands.

The *cellular, areolar, or submucous coat* resembles the same coat in the small intestine, and serves to connect together the mucous and muscular tunics.

The *mucous membrane* is of a greyish or pale yellow colour, smooth and not thrown into special folds. In its minuter structure the mucous membrane consists of a muscular layer, the *muscularis mucosæ*, of a quantity of retiform tissue in which the vessels ramify, and of a basement membrane which supports epithelium of the columnar-shaped variety.

Situated in both the mucous and the submucous coats are two other structures—the *simple follicles* and the *solitary glands*. Both resemble the same structures found in the small intestine. The former, however, are more numerous and closer together. The latter, while scattered irregularly throughout the entire length of the cæcum and colon, are more abundantly distributed in the former.

Vascular supply.—The large intestine receives its blood supply from branches of the superior and inferior mesenteric arteries. The cæcum, ascending colon, and transverse colon receive their arterial supply from the ileo-colic, colica-dextra, and colica-media branches of the superior mesenteric; while the descending colon and the sigmoid flexure receive their supply from the colica-sinistra and sigmoid branches of the inferior mesenteric. The final dis-

tribution of these vessels to the bowel coats resembles in all respects the course taken by the arteries in the small intestine.

The venous blood is returned by the superior and inferior mesenteric veins, which correspond in their distribution to the same-named arteries. The inferior opens into the splenic vein, while the superior unites with the same vein to form the vena portæ. The lymphatics, after leaving the bowel, pass into a chain of glands situated close to the intestinal wall, and are continued from there to other glands situated along the vascular arches formed by the arteries previous to their distribution. The lymphatics of the cæcum, ascending the transverse colon, after passing through their proper glands, enter the mesenteric glands; while those of the descending colon and sigmoid flexure pass into the lumbar glands.

The **Nerve supply** is derived from the sympathetic. The superior mesenteric plexus, which is a derivative of the great solar plexus, supplies filaments to all the branches of the artery of the same name, that is to say, it supplies the cæcum, the ascending and transverse colon; while the remaining portion of the large intestine is supplied by radicles from the inferior mesenteric, itself a derivative of the solar plexus, indirectly through the aortic plexus.

The ileo-cæcal valve.—At the junction of the ileum with the cæcum are two reduplicated folds of mucous membrane, semilunar in shape and so disposed that when their margins are in apposition any regurgitation from the large into the small intestine is prevented (see Fig. 48). At the base of the mucous valves is a band of the circular muscle fibres continuous with those of the internal coat of the intestine. The inner surface of each fold is smooth, and continuous with the mucous membrane of the ileum, and, like it, also covered with villi: the outer surfaces, on the other hand, are continuous with the mucous lining of the cæcum, and, like it, devoid of villi.

Physiology.—The functions exercised by the large intestine are much the same as those of the small, with such modifications as possibly depend upon the somewhat altered calibre of the canal and the differences in the structure of the mucous membrane. The passage of the contents of the small intestine into the large is followed by a considerable

retardation in their progress. A further change is effected in the consistency of the fæces: from a somewhat fluid condition they begin to assume a solid form, due to the absorption of the more liquid portions. Chemical changes take place, whereby the intestinal contents become acid in reaction and develop the peculiar characteristic fæcal odour.

CHAPTER XL.

INJURIES. INFLAMMATION. ULCERATION. ACTINOMYCOSIS.

Compared with those of the small bowel, injuries to the large intestine are much less frequently met with. The difference is most marked in the cases of contusion and rupture; and the reason for this appears to be, first, the anatomical situation of the bowel around the abdominal cavity, and secondly, the fact that in its intimate structure it is strengthened by longitudinal muscle bands.

As regards the causes of contusion and rupture, their symptoms and treatment, there is nothing to add to what has already been said in the case of like injuries to the small intestine. It is usually not until operation or after death that the exact seat of the lesion is ascertained.

The other injuries, such as punctured and incised wounds, gunshot wounds, and lesions arising from the ingestion or presence of foreign bodies, have been treated of in conjunction with the like wounds to the small intestines. (See page 227.)

Inflammation of the cæcum—cæcitis or typhlitis—occasionally results from the lodgment of hard fæcal masses. Such inflammation may extend to the surrounding tissues and, if coupled with ulceration and perforation, give rise to fæcal abscesses in the iliac and inguinal regions. Typhlitis in its more extended sense has been taken to include affections of the appendix vermiformis. Inflammation, however, of this latter will receive separate consideration in another place.

Inflammation.—Simple inflammation, or colitis, possesses little or no interest to the surgeon. It is only in the more advanced stages of the disease, when inflammation has led to ulceration, that complications not infrequently supervene in which the question of operative intervention arises.

Ulceration.—Considerable difficulty attaches to any endeavour to classify non-malignant ulcers of the large bowel. Certain forms, such as the typhoid and the tubercular, are sufficiently distinctive; but many others, in addition to being etiologically obscure, possesses neither a pathological nor a clinical basis for classification. It is therefore only possible to treat the subject by discussing each form of ulceration under its predominating feature, whether this be clinical or pathological.

Simple ulcer.—It would appear that in not a few instances ulceration of the colon takes place similar in all respects to that which is met with in the stomach and the duodenum; that is to say, the simple chronic ulcer of these regions is occasionally met with in the colon. Like these also, the ulcer in the colon often perforates, and produces results quite similar, such as abscess or peritonitis. These ulcers may be found in any part of the large bowel. Occasionally only one large ulcer is present; but as frequently, in addition to this, smaller ones exist in other parts. Like those in the stomach, no definite cause is known to account for their origin. In some instances the patients have been subjects of Bright's disease; but they are often found in patients who have been long sufferers from other forms of visceral disease.

Wilks and Moxon* consider it probable that these ulcers have the same pathology as varicose ulcers of the leg or internal hæmorrhoids, that is to say, they are due to some retardation of the venous circulation.

In character they present raised indurated edges, some spreading, while others may be healing. They extend mostly in a transverse direction round the bowel, so that it is possible they may in some instances be the cause of simple cicatricial stenosis.

Symptoms and treatment.—The cases are too few and too obscure in their symptoms to admit of being

* *Pathological Anatomy*, 2nd edit. p. 409.

diagnosed during life. The presence of blood in the motions, with the absence of any other obvious bowel symptoms or general constitutional disturbance, might admit of the supposition of simple ulceration of the colon.

The failure of any medicinal or conservative measures to check the hæmorrhage, and the increasing debility of the patient, would reasonably admit of some operative investigations. Any measures employed in dealing with the ulcer, if happily found and exposed, would resemble those suggested and practised in the case of simple chronic ulcer of the stomach.

Typhoid ulcer.—Ulceration of the colon in typhoid fever, while rare as compared with its occurrence in the small bowel, is occasionally met with, and cases are recorded where perforation has taken place. The "Transactions" of the London Pathological Society contain the records of many cases, showing to what an extent the large bowel may be involved in ulceration.

For the pathological description of these ulcers, see Small Intestine, page 245.

Tubercular ulcer.—The large intestine, and more particularly the cæcum, is liable to be extensively involved in tubercular ulceration. This region may be implicated alone, or in conjunction with the small intestine.

The ulcers resemble in all pathological respects those found in the small intestine, and, like them, are liable to heal and form a stricture, or progress until they perforate.

Symptoms and treatment.—Tubercular ulceration of the large intestine causes symptoms which will be found better discussed in works on medicine. They appear to be variable. Sometimes there is constipation, but there may be intractable diarrhœa, and in other cases there is entire absence of any bowel trouble.

It is rarely that surgical intervention is called for; nevertheless, portions of the large intestine have been successfully excised for tubercular disease. In more than one recorded case the cæcum and a considerable portion of the colon have been successfully removed.

Dysenteric ulcer.—Ulceration the result of dysentery is most frequently met with in the rectum, but any portion of the large bowel may be implicated. It is usual

for the lower part to be more extensively affected than the upper.

Considerable variation exists in the size, shape, and arrangement of the ulcers. In some cases they are circular and distinct, while in others they occur in irregular groups. In others, again, extensive areas are involved, so that small isolated patches of mucous membrane are seen projecting from the surface.

The surgical aspects of the disease exist in the complications which may arise in the course of the disease or subsequently. Thus perforation may take place or peritonitis arise from extension of the inflammation to the peritoneum. Severe hæmorrhage occasionally happens, and stricture may result from the healing and contraction of a large ulcerated surface.

General ulcerative colitis.—Cases occasionally come before the physician of extensive ulceration of the colon, a disease which appears to run an uninterrupted fatal course. The mucous membrane of the bowel is in some places completely destroyed, while in others islets or tags are left which have the appearancs of small polypi. The following are some of the clinical features associated with this disease.

Females are more frequently attacked than males, and the average age at which the disease appears is about thirty-one years in the female and forty-three in the male. There are apparently no prodromal symptoms, nor does there seem to be any predisposing cause; in nearly all the cases the patients appear to have been in good health at the time of onset. The disease commences like an ordinary attack of summer diarrhœa. The patient passes motions several times a day; these frequently contain blood, and occasionally sloughs. The stools are not of a dysenteric character. There is little or no fever, and only occasionally some pain. Rapid emaciation takes place, and death ensues usually in from four to ten weeks. Perforation but rarely occurs. At the post-mortem little else than ulceration of the large intestine is met with. The kidneys in some instances have shown evidence of disease; and it is maintained by some that the condition is a frequent concomitant of Bright's disease.

This disease, while usually deemed of a purely medical character, is introduced here because surgical intervention

seems a not unreasonable consideration in discussing the subject of treatment.

It is sufficiently known to surgeons that ulceration on the surface of the body from whatever cause is always greatly benefited by the simple enforcement of rest and the local application of cleansing agents. It seems therefore quite reasonable to hope that if such measures could be carried out in the case of the large bowel, some improvement might be looked for.

The initiative in this line of treatment seems to have been taken by Mayo Robson,* and to have been carried out with good success in a case which is recorded as one of

Ulcerative or Membranous colitis. Various kinds of medical treatment have been adopted without avail. An inguinal colostomy was then performed, and the ulcerated surfaces of the colon irrigated with boracic solution from the anus to the artificial opening, and *vice versa*. The patient was apparently cured. More recently Hale White and Golding-Bird† report the successful treatment by right inguinal colostomy of similar cases.

Ulcer from obstruction.—As the result of obstructive disease, whether due to simple or malignant stricture, ulcers frequently form in some part of the bowel above the obstruction. The commonest seats are immediately above the obstruction and in the cæcum. It is a common occurrence to find in obstructive disease of the sigmoid flexure one or more large ulcers in the cæcum tending towards perforation.

In what particular way ulceration is caused is not known, but Goodhart thinks it possibly due to one of two influences, "Either the over-distension leads to stretching and narrowing of the blood channels, and so to gangrene; or else the material retained acts as an irritant and leads to ulcerative inflammation."

These ulcers occasionally perforate and cause peritonitis. If, however, adhesions have formed between the floor of the ulcer and other parts, an abscess may develop which, bursting externally through the skin, or internally into another portion of the intestinal canal, may result in the

* *Trans. Clin. Soc. Lond.* 1893, vol xxvi. p. 213.
† *Clin. Soc. Lond.*, May 12, 1899

formation of a fistula. Such a result may, in some instances, lead to more or less temporary relief of the obstructive symptoms.

In cases of obstruction from fæcal accumulation, small patches of mucous membrane frequently necrose, and on separation leave lesions which are known as *stercoral ulcers.* These ulcers vary in size and number, and are most frequently met with in the cæcum. By extension they may lead to chronic local peritonitis with adhesions, or even perforate and cause acute peritonitis. In some cases they heal, and if originally of sufficient size and extent, they may result in stricture. It is rarely possible to determine the existence of stercoral ulcers. The cause which has given rise to them generally masks any symptoms which might otherwise indicate their existence. A sudden attack of acute pain, sufficient to produce prostration, occurring in a case of chronic constipation would probably indicate rupture or perforation of such an ulcer.

Ulceration following upon lesions of the spinal cord.—In deaths from fracture of the spine and from pathogenic lesions of the cord, ulcers have occasionally been found in the large bowel. These are probably of a trophic kind, and arise in the bowel as they are apt to arise on any part of the body where sensation has been lost.

Syphilitic ulcer.—These are occasionally met with in the large bowel, and probably result from the breaking down of gummata situated in the submucous tissue. Their commonest seat is in the rectum, where their pathological features will be more fully described.

Catarrhal ulcer.—These are found mostly in the colon, and are associated with an acute or chronic inflammatory condition of the mucous membrane. Existing at first as simple isolated erosions of the surface, they may extend and embrace considerable areas of surface. A form of ulceration known as follicular is probably of a character similar to, if not the same as, that due to catarrh of the mucous membrane. Associated with this kind of inflammation is the presence in some cases of a fibrous-like deposit on the surface of the mucous membrane. When this extends to any degree, complete casts of the bowel are found. The disease under such circumstances is sometimes termed membranous, pellicular, or diphtheritic colitis.

Except that relief might possibly be afforded by colostomy at the commencement of the ascending colon, these cases have but little interest for the surgeon. (See above.)

Actinomycosis.—A few cases have been recorded. The condition leads usually to abscess, which bursting externally gives rise to a fæcal fistula. In the pus discharged small granules of actinomyces will probably be found.

CHAPTER XLI.

NON-MALIGNANT OR CICATRICIAL STRICTURE.

This form of stricture owes its origin to causes similar to those which induce the same condition in the small bowel. Independently of ulceration it is probable that no other initial lesion exists for the production of stenosis. The kinds of ulcer the healing of which are liable to cause stricture, are the tubercular, the simple or chronic, the dysenteric, and the stercoral. But which of these may be the cause in any particular case of stricture it is often impossible to say, although the early history of the case may in some instances give a clue. Thus any attack of dysentery, or evidences, in some form, of tubercular disease, or of chronic constipation, may indicate the nature of the ulcer which has given rise to the subsequent symptoms of stricture. Females rather more than males are the subjects of simple stricture.

In a case which I have recorded*—that of a girl—an abscess in the abdominal parietes communicated with the dilated portion of the transverse colon in front of a stricture of the splenic flexure. Numerous strictures of varying degrees of tightness existed throughout the bowel, and also several circumferential ulcers in various stages of cicatrisation.

There is no constancy in the period which intervenes between the stage of ulceration and the resulting cicatrix, nor in the form of the stenosis which follows any particular

* *Trans. Path. and Clin. Soc. Glasgow* 1892, vol. iii. p. 37.

disease. In regard to the former an interval of months or years may exist between the initial lesion and the symptoms resulting from subsequent stricture; while in the latter, symptoms of obstruction are only likely to arise where the preceding ulceration has extended for a considerable distance circumferentially round the bowel. Thus it happens that strictures of the bowel are more frequent as pathological than as clinical observations.

The very limited number of cases recorded does not admit of any statement as to the relative frequency of stricture in one region as compared with another. No part, from the ileo-cæcal valve to the lower end of the sigmoid flexure, appears to be exempt.

Symptoms.—Considerable variation exists in the symptoms consequent on stenosis of the large bowel. Thus it may be said that the nearer the seat of stricture to the small bowel, the more do the symptoms approach those dependent upon a similar involvement of the latter; while, on the other hand, the nearer the constriction to the lower end of the sigmoid flexure, the more the symptoms resemble those of stricture of the rectum.

The earliest symptom to manifest itself is usually constipation, which, as it increases, frequently requires the use of purgatives. The motions are usually well formed, any alteration in shape indicates a stricture low down in the rectum. Associated with the need of relief are attacks of paroxysmal or colicky pains, which subside so soon as the bowel is unloaded. Not infrequently a temporary attack of diarrhœa supervenes upon the relief of the distended bowel.

Sooner or later an attack of obstruction ensues, with an aggravation of those symptoms which have only been previously suffered from to a slight degree. Thus the paroxysmal pain becomes more marked and more frequent. Aperients may intensify rather than diminish the pain. Tenesmus exists in some cases; while vomiting, limited at first to the contents of the stomach, may or may not prove a prominent feature. The abdomen is noticed to distend, partly as the result of accumulated flatus and partly owing to fæcal distension of the intestine above the stricture. The abdominal parietes are flaccid, and, if thin, may admit of palpation of the distended gut. More particularly does a

loaded colon become perceptible when the stricture is situated low down in the sigmoid flexure. During the attacks of paroxysmal pain, the vermicular action of the walls of the distended small intestine may become visible. This state of things may last for some days, when sudden relief of the intestine, through the passage of a large and copious motion, will cause all the symptoms to subside, and the patient may then for a period return to a state of comparative well-being.

After a variable interval of time, either as the result of some indiscretion in diet or from increased narrowing of the strictured channel, another attack of obstruction ensues, with a repetition of all the previous symptoms. The completeness of the obstruction in this renewed attack may have caused the case to enter upon its last and fatal stage. The vomiting may now assume a stercoraceous character, and the pain, hitherto paroxysmal, become continuous. Death is sometimes ushered in by peritonitis.

The general condition of the patient is usually one of gradually increasing weakness and emaciation. This, however, is not so marked in the earlier stages of the disease. But repeated attacks of obstruction soon undermine the health and strength.

Diagnosis.—The symptoms of stricture of the large intestine sometimes so closely resemble those of the small that differentiation becomes all but impossible. Where, however, a distinction can be drawn, it will be found probably to exist in one or other of the following details.

Attacks of obstruction of the large bowel are less acute. Vomiting is not such a prominent symptom, and is much longer in becoming fæcal. Food rarely causes an attack of pain, and is not necessarily followed by vomiting. Abdominal distension is more marked, and the peristaltic action of the bowel usually visible. Aperients augment rather than diminish the pain. Complete obstruction is much longer in bringing about a fatal result.

In distinguishing between symptoms connected with stricture of the large bowel and those dependent on stenosis of the rectum, not so much difficulty exists, inasmuch as the rectum admits of more or less complete examination by mechanical means. It is not usually possible to determine the exact seat of a stricture, except when it is located in

the sigmoid flexure. In this region the injection of water *per rectum* may, according to the amount introduced, convey some idea as to its situation. It must, however, be remembered that the fluid may find its way through the stricture, and so mislead rather than guide. Another symptom, of which more will be said when discussing stricture of the rectum, is the so-called "ballooning" of the bowel below the obstruction; that is to say, the rectum becomes widely dilated from within the anus upwards.

Treatment.—Relief of the earlier symptoms will be best effected by a careful attention to diet and proper regulation of the bowel by the administration of mild aperients. As the stricture tightens and temporary attacks of obstruction supervene, the use of copious enemata will likely afford the readiest relief. Violent purges should be avoided; and, failing any beneficial result from the use of simple aperients, the opposite treatment of rest to the bowel, by giving belladonna and opium, should be tried. When all conservative measures fail, there is nothing but operation to afford relief. The bowel must be opened above the stricture by a right or left colostomy, according to the situation of the obstruction; and if a left inguinal or lumbar colostomy shows the bowel to be collapsed, the wound should be closed and the ascending colon opened. When the stricture is seated in the cæcum or at the ileo-cæcal valve, enterostomy must be performed. Péan * has succeeded in two cases of simple stricture of the ileo-cæcal valve by performing coloplasty. After withdrawing the part and clamping both ends of the bowel, the strictured valve was divided in the long axis of the gut, and the edges of the wound so formed united transversely. For any further operative measures upon the stricture itself, what has been said on this point in the case of stricture of the small intestine might be repeated here. (See page 289.)

It need hardly be indicated that where there is just reason to believe that a patient, in the early stage of the disease, is suffering from simple stricture of the large bowel, early operative intervention holds out the best and possibly the only hope of an ultimate cure.

* *Annual of the Universal Medical Sciences*, 1892, vol. iii. C—69.

CHAPTER XLII.

INTERNAL STRANGULATION. ADHESION, AND KINKING. INTUSSUSCEPTION. VOLVULUS.

The size, situation, and fixity of the large intestine renders it peculiarly exempt from many of those sources so prone to strangulate the small bowel

As regards internal hernia, the only situation where the large bowel appears to have been strangulated is through an opening in the diaphragm. In most instances, if not in all, the bowel has passed through a congenital aperture either alone or in conjunction with the stomach and other viscera.

The cases recorded are very few. In one of my own,* the symptoms were those of acute intestinal obstruction. In this instance the splenic flexure of the colon was nipped in an aperture in the left expansion of the diaphragm. Through this aperture had passed a mass of omentum, which, from its organic connection with the subpleural tissue, seemed to indicate that the incarceration had existed for some time. The only clinical feature which could be said to have thrown any true light upon the nature of the obstruction was the sausage-shaped tumour felt in the epigastric and left hypochondriac regions. This, however, proved in reality to be a misleading factor in the diagnosis, as it naturally led to the belief that the tumour was an intussusception. The operation showed it to be the distended transverse colon passing upwards to the diaphragmatic aperture. (See Fig. 49.)

Adhesions.—Adhesions involving the large bowel to variable degrees are common enough, but it is comparatively rare for such adhesions to cause obstruction similar to that which is not infrequently met with in the case of the small intestine.

The causes which give rise to these adhesions are mostly similar to those already described as affecting the small intestine, and are directly due to local attacks of peritonitis.

* *Glasgow Pathological and Clinical Society's Transactions*, vol. vi. p. 78.

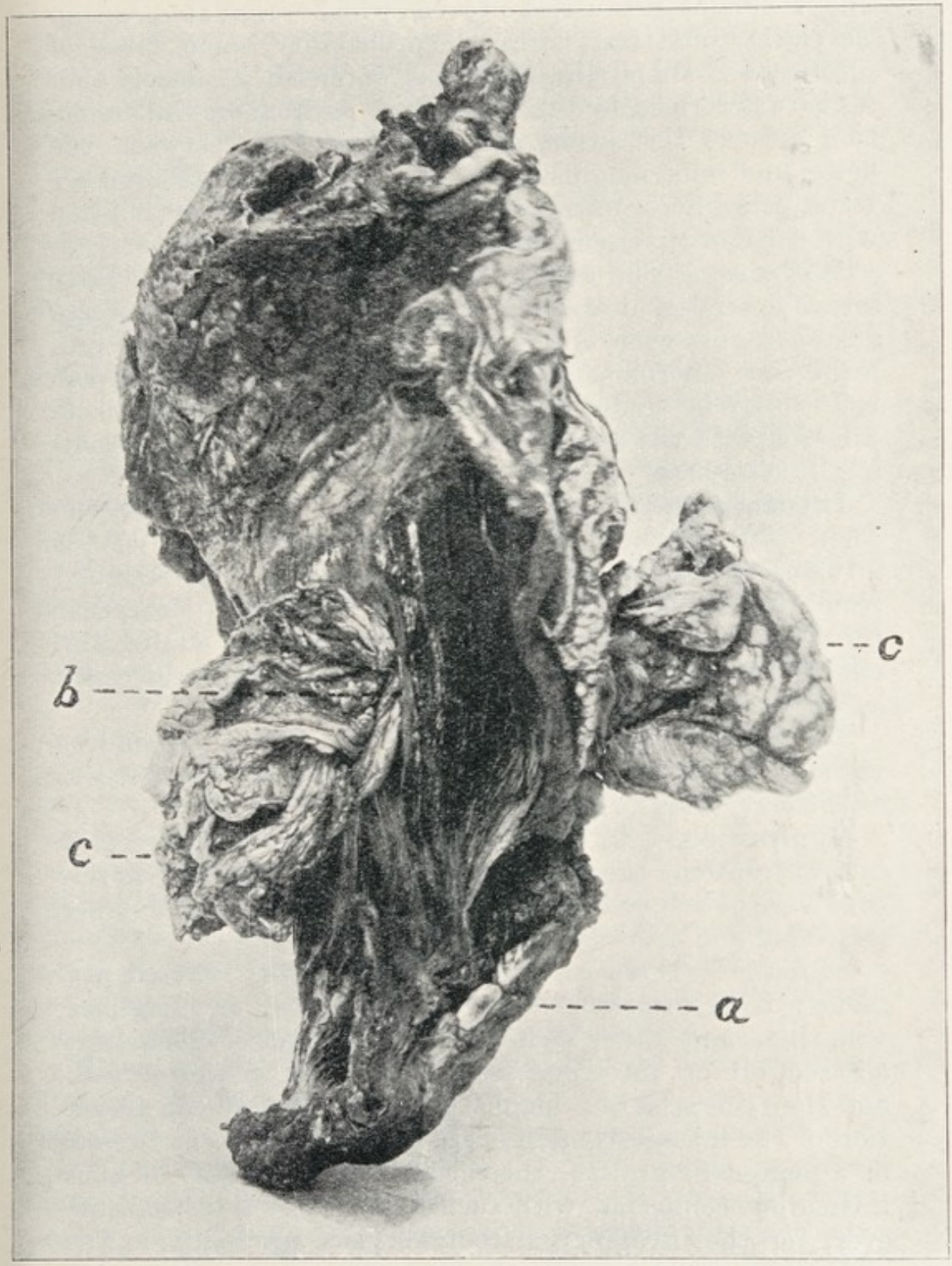


FIG. 49.—DIAPHRAGMATIC HERNIA.—*a*, ribs; *b*, margin of aperture in abdominal aspect of diaphragm; *c*, *c*, incarcerated omentum passing through diaphragmatic aperture into subpleural tissue. (*V.I.M., Glas.*)

The commonest cause, however, which originates within the large intestine, is in all probability some form of ulceration. When the ulcer has extended so deeply that its base is formed by little else than peritoneum, inflammation attacks the latter, and adhesions form between the bowel and some neighbouring tissue or organ. As a further result of such a connection, fistulæ may become established with some other viscus, or an abscess may form.

Kinking.—The attachment and position of the large intestine renders it specially exempt from any acute bending. Instances, however, occasionally occur where it seems probable that enormous distension of the colon may be the result of some undue flexion of the sigmoid flexure at its junction with the rectum. Kinking from adhesions, resulting in obstruction, is very rare.

Intussusception.—Invagination of one part of the colon into another—that is to say, the colic variety of intussusception—is rare. Cases, however, are recorded from time to time, and from these it would appear that the condition is most frequently met with in adults, and usually owes its cause to some definite local stimulus, such as is furnished by a tumour or stricture.

The intussusception is almost always of the descending variety; but a few cases have been recorded where it was of the ascending form.

Symptoms.—As distinguished from the other forms of intussusception, the symptoms associated with the purely colic variety are much less sudden in their onset and much less rapid and acute in their progress.

In most of these cases the patients have suffered previously from attacks of colic, constipation or diarrhœa, vomiting, and other symptoms indicative of temporary obstruction or intestinal irritation. But in those cases, and they comprise the majority, where prior to the formation of the intussusception there exists an innocent tumour or a malignant growth, the earlier symptoms may be more intimately connected with such lesions. It is usual, however, for the invagination to take place gradually, and so attacks of obstruction may occur from time to time as the direct result of such a process.

When the intussusception becomes a marked feature in the case, it frequently projects into the rectum, and is

sometimes protruded through the anus. In such cases it is possible both to feel and see the tumour. Tenesmus with the passage of blood and mucous then become pathognomonic symptoms. Further, the typical sausage-shaped tumour may be felt in the left iliac fossa or in some other region of the abdomen.

Complete blockage of the canal occasionally occurs, and when it does so, vomiting sets in, with distension of the abdomen and other symptoms of acute intestinal obstruction.

The chief distinguishing features between this form of intussusception and that of the small intestine are, the age of the patient, the history of antecedent bowel trouble, and the comparatively non-acute progress of the affection. The detection of a polypus, or some malignant growth, forming the apex of the intussusceptum, is almost equally distinctive of involvement of the large bowel.

Prognosis.—There is little to hope for without surgical intervention; the more is this true when the cause is some kind of tumour. As an example, however, of natural cure may be instanced the case of a boy aged seventeen years, who, after suffering for seventeen days from symptoms of obstruction of variable and intermittent degrees of acuteness, passed a sphacelus of bowel thirteen inches in length, seven inches of which represented intact bowel, while the remaining six inches consisted of a ribbon of only half the circumference of the gut. The presence of unmistakable appendices epiploicæ proved it to be large intestine. Natural recovery by the separation of a sphacelus of bowel is quite exceptional; in most cases death will supervene before such time has elapsed as will admit of the natural separation of the intussusceptum.

Treatment.—Each case will need to be dealt with on its own merits. In the two reported cases, success was obtained by first forcibly dilating the anus, removing the papillomatous growth, and then, with the hand inserted into the rectum, pushing up the bowel. It is possible that many surgeons do not possess a hand which measures circumferentially nine and a quarter inches over the knuckles, in which case injection, inflation, or some other simple mechanical measure for pushing up the bowel must be tried. In another reported case, the malignant stricture

was excised, and the bowel then successfully pushed up. In a third instance laparotomy was performed and the intussusception easily reduced by pressure from below. The tumour was then successfully excised.

Volvulus.—Twists are more frequently met with in the large bowel than in the small; the predisposing causes are, however, much the same in both. Either there is a congenital malformation in the form of an abnormally long meso-colon, or this latter has become elongated owing to continuous overloading of the bowel, such as is liable to occur in some cases of chronic constipation. Old adhesions may also in some instances prove the initial cause. Among the most important direct or exciting causes are irregular distribution of the intestinal contents and violent peristalsis.

As regards the seat of the volvulus, the segment most often implicated is the sigmoid flexure, and next to that the cæcum; the transverse colon is but rarely affected. The twisting of any part may take place in one of three ways: the bowel may rotate on its own axis, intertwine with another portion, or twist about an axis formed by its mesentery.

Volvulus is more frequently met with in males than in females, and usually occurs after middle life.

The result of twisting is to cause obstruction, and certain changes within the affected portion. As regards obstruction, the more complete the twist the more complete the blockage. When a loop of bowel rotates on its mesentery, obstruction is likely to be of an acuter character than when it revolves upon its own axis.

The effect of a twist upon the involved parts depends upon its form and the degree of rotation. When a loop of bowel rotates upon its mesenteric axis to more than a half-turn, the mesenteric vessels become strangulated, and the loop rapidly gets congested, dilates, and subsequently becomes gangrenous. Adhesions are formed and general peritonitis sooner or later sets in. The distension of the involved loop is sometimes considerable.

Symptoms.—The symptoms are usually those of acute obstruction, with certain features which sometimes render it possible to diagnose the true cause. Thus an important early physical sign is a circumscribed area of tympanites which corresponds to the distended loop involved, the remaining portion of the abdomen being more or less dull

to percussion. When the volvulus is situated in the sigmoid segment, vomiting is not usually a constant symptom. Colicky pains are complained of from the first; and general abdominal distension becomes a marked feature at a later stage.

Treatment.—When seen within a few hours of the onset of acute symptoms, copious injections of water should be given with the object of emptying the lower bowel, and, if possible, untwisting the involved loop through distension of its canal. Massage, after the plan advised by Hutchinson, may also be practised. These measures, however, failing, or as a primary resource in cases at a later stage, the abdomen must be opened.

The incision, made in the median line, below the umbilicus, must be of sufficient length to admit of the volvulus being brought outside the wound. If the bowel has not become gangrenous its distension must be relieved by a longitudinal incision an inch or so in length. This will admit of the escape of gas and fæces, and all due care must be taken, in the suitable arrangement of cloths, &c., to prevent any contamination of the peritoneum with the outflowing fæces. The opening in the gut must be closed by Lembert stitches; and after rectifying the position of the bowel, the parts are returned into the abdominal cavity and the parietal wound closed.

In some cases it may happen that considerable distension of the colon and intestines above co-exists and interferes with the replacement of the untwisted loop. It will then be necessary to relieve the distension of these parts in a similar way to that adopted in the case of the loop itself.

It occasionally happens that recurrence takes place. In order, therefore, to prevent such a mishap, the bowel may be stitched to the parietes.

When the bowel has became gangrenous, or adhesions have formed, so that it is neither safe nor possible to attempt replacement, further measures must be adopted. In the former case excision of the volvulus is necessary; while in the latter, intestinal anastomosis must be established.

For further details in connection with the treatment that may be required in dealing with the intestine and with the peritoneal cavity, see page 263.

CHAPTER XLIII.

GALL-STONES, ENTEROLITHS, FÆCAL ACCUMULATION.

Gall-stones.—It is rarely that the presence of a gall-stone in the large intestine gives rise to symptoms of any moment. Its lodgment for a time in the bowel may cause irritation, but it is exceptional for obstruction to result.

Enteroliths.—Intestinal concretions or calculi have already been alluded to as occurring in the small intestine. They are, however, more frequently met with in the large, where they exist for an indefinite period without giving rise to symptoms.

In structure and consistence they vary. In some cases they are hard and composed of mineral substances, chiefly phosphatic combined with animal matter, and sometimes cholesterine. In others they are comparatively soft or porous, composed of matted masses of vegetable substances mixed with fæcal matter, the former consisting frequently of undigested ligneous fibres. A third variety exists, which is formed by the aggregation of substances which have been taken for medicinal purposes; such are subnitrate of bismuth, carbonate of magnesia and iron the result of drinking certain chalybeate waters, and chalk.

Symptoms.—In the few cases recorded, the symptoms have varied. When present to any marked degree they are usually dependent upon intestinal catarrh.

Fæcal accumulation.—The abnormal accumulation of fæces within the large intestine as a whole, or in certain portions of it, occasionally gives rise to symptoms which call for surgical aid. But for such accidents the subject is one which falls more within the domain of the physician than the surgeon. Only such facts therefore will be introduced here as serve to elucidate and explain those complications to which such forms of obstruction may give rise.

Into the various causes which conduce to the accumulation of fæces in one or other part of the large bowel it is not proposed to enter, nor will any note be taken of the

enormous masses which may so collect, and the variable periods occupied in their collection.

No segment of the large intestine is exempt; one or more may be involved at the same time. The cæcum, however, is the commonest situation for fæcal collections, and next to it the sigmoid flexure; but in some instances the entire canal of the cæcum, colon, and sigmoid flexure become uniformly blocked and distended.

Results of fæcal accumulation.—In the majority of instances little more than a sense of abdominal discomfort exists, with possibly some loss of appetite and general malaise, the relief of which immediately follows upon a movement of the bowels. The following, however, are some of the untoward symptoms which may arise, and suggests the advisability of a surgeon's opinion, if not also his operative intervention.

False tumour.—These fæcal masses possess characteristics sufficiently distinctive to enable them usually to be diagnosed. Thus they pit on pressure, having a dough-like feel to the touch, and can be modified in shape by squeezing. Pressure usually causes no pain. In other cases the tumour is quite hard and unresisting, conveying the sense of the presence of an intestinal calculus.

Pressure.—Symptoms of variable degrees of gravity arise as the result of pressure of a large accumulation upon some important organ. Middleton* describes two cases where the results of pressure were seen upon the heart. In one the apex beat was displaced upwards half an inch, and inwards, so as to lie to the inside of the nipple. In the other the area of cardiac dulness and the apex beat were greatly displaced upwards. In this same case there was considerable pressure upon the bladder, great difficulty was experienced in micturition, no urine passing sometimes for twenty-four hours, and then only in very small quantity. In some cases of great distension the diaphragm is pushed upwards and impeded in its action, so that there is considerable embarrassment in respiration.

Ulceration and perforation.—A serious complication of prolonged fæcal accumulation is ulceration of the bowel. This form of ulceration has already been discussed under

* *Glasgow Med. Journ.* 1894, vol. xli. No. 5, p. 341.

the heading of "Stercoral ulcer" (see page 319). It is only necessary to briefly refer to it here. The process of ulceration usually takes place slowly, and is frequently unattended by any indications until perforation occurs, when the patient is suddenly seized with violent and acute symptoms. Should the perforation cause a communication with the general peritoneal cavity, fatal peritonitis rapidly ensues.

In some instances the stercoral ulcer perforates into the neighbouring cellular tissue, or contracts adhesions to other parts, so that a localised fæcal abscess results, which may burst externally or empty itself into the bowel. Possible later sequels to these ulcers are strictures of the bowel.

Rupture.—In some few instances the enormous distension of the gut has led to rupture. The extraordinary power of adaptation which the bowel possesses under a slowly distending force renders it probable, however, that in most instances the rupture results from previous weakening of the intestinal wall through ulceration.

Fæcal absorption.—The prolonged retention of fæces within the bowel is liable to result not only in some changes in the mucous lining of the intestine, but in some chemical alteration of the fæces themselves. The combined result of which it is possible to conceive might lead to the absorption into the system of products capable of causing variable symptoms suggestive of septic poisoning. In one such instance the patient's symptoms during life were persistent vomiting, high temperatures accompanied with delirium, and parotitis.

Acute obstruction.—Ileus paralyticus, as this condition of acute obstruction is sometimes termed, is the worst and final phase of fæcal accumulation. Innocent as is the troublesome condition of chronic constipation in the large proportion of cases, instances are forthcoming to show that the limits of intestinal forbearance are sometimes reached, and for some usually inexplicable reason the patient more or less suddenly becomes attacked with symptoms of acute intestinal obstruction. In some instances, however, there have existed premonitory indications, in the way of greater difficulty than usual in getting a movement of the bowels, the trouble being accompanied with some loss of appetite, foulness of tongue and breath, nausea, and even vomiting, symptoms which for the time being have cleared up immediately the bowels have been opened.

Why, after a long period of constipation, symptoms of obstruction should suddenly arise it is not easy to determine. Treves * attributes the attack to one of these causes : abrupt occlusion of the colon by torsion or kinking, peritonitis set up by stercoral ulcers, and distension of the small intestine due to the long-tried ileum becoming finally exhausted and accumulation taking place above the ileo-cæcal valve. It may also possibly be due to paralysis of the large bowel, which finally refuses to react to any further stimulus, and so causes a stoppage as complete as that effected by a volvulus or an intussusception. The frequency with which, it is known, acute symptoms follow upon the administration of a purge to relieve a loaded colon, possibly receives its explanation from one of the last two causes given above. Fæcal accumulation is sometimes caused by pressure from without. A displaced kidney has been supposed to be the primary and immediate cause of inducing fæcal accumulation and obstruction in some instances.

When once acute obstruction has set in, the symptoms are practically indistinguishable from those arising from other causes of obstruction. The history of years of troublesome constipation, with the possible existence within the abdomen of a tumour, doughy to the touch, painless or only slightly painful, and capable of being moulded by pressure —such are the only features which can be said to lend aid of any value in the formation of a correct diagnosis. Even with these, however, it is sometimes impossible to say whether the symptoms may not be due to a tumour or to stricture ; and the true nature of the case does not become manifest until at the time of the operation or post mortem.

Treatment.—Perforation or rupture the result of ulceration must be treated on the lines already laid down in connection with perforation of the bowel from other causes. What is of most interest, at present, is the treatment of cases which are suffering from, or show premonitory symptoms of, intestinal obstruction. It is mostly with such that the surgeon is, as a rule, concerned and where his opinion is required.

In most instances treatment of some kind has been adopted for the chronic condition of constipation which has

* *Lancet*, 1885, vol. ii p. 1133

preceded the acute attack, and has been persisted in and increased as preliminary treatment of the attack itself. Hence it is not infrequent to find that the patient has had powerful purgatives administered and copious enemata injected. The former only too often increase the severity of the symptoms, and no further trials of such a kind should be persisted in. The patient should rather be kept from the administration of anything by the mouth, food as well as medicine.

With regard to fluid enemata, either water or oil may be employed; the former is preferable. The object to be attained is percolation of the mass with fluid, so that, being thus loosened and softened, it may the easier be dislodged and passed. The additional distension may also serve as a stimulus to peristaltic action. The tube for injection should be inserted well up the rectum, if possible into the commencement of the sigmoid flexure; it is doubtful whether it is possible to project it further than this. When the tube appears to pass higher up, it is more than likely that it is being doubled upon itself at the upper part of the rectum. The fluid may be passed in, either by means of an ordinary Higginson's syringe, or allowed to gravitate from a funnel or filter held two or three feet above the bed.

Massage may prove of considerable service, but should only be employed at an early stage of the symptoms. If a mass can be felt it should be carefully kneaded; and to facilitate the action of the hand and fingers, some lubricant, such as oil or vaseline, should be freely applied.

Failing any relief by such conservative measures, it becomes necessary to consider the question of emptying the bowel by operation. The operation best suited for removing the contents of the bowel is colotomy. It has been several times practised with success.

Assuming that there is no guide to the portion of the bowel most involved, an incision in the left iliac region should be first made; if, however, the sigmoid flexure be found undistended, the wound should be closed, and the cæcum explored by an incision in the right iliac region. In cases where the bowel has got displaced from its normal position by reason of the weight of fæces it contained, it may, after being emptied, be secured in its place by stitching it to the parietes (colopexy).

CHAPTER XLIV

TUMOURS—INNOCENT AND MALIGNANT.

With the exception of carcinoma, tumours involving the large intestine resemble those met with in the small. They may differ, however, in their relative frequency, the large bowel being more often the seat of certain kinds than the small; and they may differ also in their clinical aspects, more acute and serious symptoms being likely to arise when the tumour is situated in the small than in the large intestine.

Adopting the usual division of innocent and malignant growths, the latter are more frequently met with in clinical practice than the former, though in the post-mortem room innocent tumours are often discovered which have caused no symptoms during life.

Innocent tumours.—In many instances, as already indicated, these tumours are purely of pathological interest, being frequently found in the ordinary course of making a post-mortem. Many are, however, capable during life of causing symptoms of obstruction, either by reason of their blocking the canal, or in some other way acting upon the bowel wall so as to invaginate, kink, or twist it.

Papilloma and adenoma.—These benign tumours are among the commonest met with in the large intestine. They vary greatly in size, shape, situation, and the symptoms to which they give rise. They are generally simple outgrowths from the mucous membrane, and resemble it in structure, being either purely papillary excrescences or glandular in formation. In some instances they are multiple, involving not only different parts of the colon, but extending into the rectum; or rather, it should be said, from the greater frequency with which they are met with in the rectum, they have extended from there into the colon. Such a condition was well illustrated in a woman, aged thirty-two, who was admitted under my care in the Victoria Infirmary. She came in with symptoms of more or less constant abdominal pain, the passage of mucous and blood, and great pain on defæcation. She had lost weight and strength. When examining the rectum I found it studded

with polypi of various sizes. I opened the descending colon and found exactly the same condition of things. This gave her relief, but much muco-purulent material was discharged through the colostomy wound. One of the polypi was removed and examined microscopically. It illustrated the simple glandular variety of tumour. She left the infirmary after about six weeks' residence practically the same. In some cases of this nature it would appear that if not actually associated with malignant disease the polypi themselves are capable of becoming changed into a type of carcinoma.

If instead of remaining sessile these solitary tumours increase in size, they become pedunculated and constitute one of the commonest forms of intestinal polypus. As such they become a not infrequent cause of intussusception. In this relation they have already been discussed, the colic form being frequently due to their presence. When so associated the tumour forms the apex of the presenting intussusceptum.

It occasionally happens that a polypus becomes spontaneously detached and is passed *per rectum;* but, failing such a natural method of cure, these tumours may remain throughout life, apparently harmless and without causing symptoms.

Fibroma and fibro-myoma.—As in the case of the small intestine, these tumours occurring in the large bowel constitute one of the forms of polypus. They vary in size, but are usually small.

Lipoma.—Fatty tumours are occasionally met with, either growing within the bowel or connected with it externally. In the latter case they are usually associated with the appendices epiploicæ. When arising within the bowel they have their origin in the submucous tissue. They may grow to a considerable size, and sometimes form pedunculated tumours or polypi, as such they have been the cause of intussusception.

Dermoids.—These tumours are occasionally met with in the large intestine. They form usually pedunculated growths, and when situated in the sigmoid flexure project into the rectum, where they can be felt.

Cysts.—These are little more than pathological curiosities. They are mostly situated about the region of the ileo-cæcal valve.

Malignant tumour.—Of the two primary forms of malignant growths, carcinoma is frequently met with, while sarcoma but rarely occurs. The bowel, when attacked by either form of disease, may be involved primarily, or growths may occur in it secondarily to primary disease elsewhere, or it may become implicated by direct extension from some neighbouring seat. When malignant disease of the large intestine is spoken of, it is always, however, taken to imply primary involvement of that region, and as such it will alone be discussed here.

Carcinoma.—The disease attacks both sexes in about equal proportion, with slight tendency, perhaps, to be commoner among females than males. There is no part of the large intestine exempt, but in by far the larger number of cases it is either the cæcum or the sigmoid flexure and the descending colon.

The disease is most frequently met with after middle life, but is not uncommon between the ages of 30 and 40, and has occurred at the early age of 22.

Pathology.—Before attempting any description of the form or forms of carcinoma which attack the large intestine, it will possibly simplify the discussion if it is first stated what classification constitutes the basis for reference. So many terms are used, and in such different senses, that in many instances it is impossible without some such basis to determine what particular form is meant.

Thus, then, I have adopted the three primary divisions of squamous-celled, columnar-celled, and spheroidal-celled carcinoma. The first two constitute the epitheliomata, while the last embraces the medullary and scirrhous forms of carcinoma, both of which signify histologically the same structure, differing only in the relative proportion of cells and intercellular fibrous tissue. The former is rich in cells and scanty in intercellular fibrous trabeculæ, while the latter is scanty in cells and possesses abundant fibrous tissue All three divisions are capable of undergoing a colloid change, when the tumour constitutes the so-called "colloid carcinoma."

If this classification can be admitted as embracing all forms of carcinoma, then all difficulty in naming any particular growth becomes materially simplified. It requires, however, that the growth be microscopically examined in

order to determine, in the majority of instances, to which class it belongs.

Judging from such cases as have been accurately investigated, it would appear that almost without exception the form of carcinoma met with in the large bowel is the columnar-celled; and where colloid disease has been met with, it is a degenerative change taking place in these same cells. That this form of tumour may assume considerable variations in its mode and rapidity of development is only reasonable to suppose from what occurs in the case of tumours elsewhere. This variation has doubtless led to the use of terms descriptive solely of macroscopical appearances. Thus the commonest form which is met with when the growth has developed to a visible and tangible extent, is a dense hard ring surrounding the gut at one particular point (see Fig. 50). It is not difficult to understand how this indurated consistence may lead to its being termed a "scirrhous" tumour, nor is it any more difficult to see how any excessive growth causing a vascular or sloughing projecting mass into the canal should be termed a "medullary, soft, or villous carcinoma."

Unless, therefore, it can be shown by a competent microscopist that any other form of carcinoma than the columnar-celled attacks the intestine, it would be wiser to accept all those cases that are described as medullary, encephaloid, scirrhous, adenoid, villous, or colloid, as variations in development of the one division of columnar-celled carcinoma.

Columnar-celled carcinoma presents usually, in the more or less advanced stage of its development, two separate appearances. In its commonest aspect it constitutes the so-called "ring stricture of the bowel." Externally it looks as if the intestine had been constricted by a string tied round it. Internally the canal is contracted at the same situation by a band of tissue which may narrow it to any degree. Frequently there is ulceration at the seat of stricture, and the upper margin of the ulcer presents a typically everted and indurated margin (see Fig. 51, frontispiece). In some cases the stricture is of a much more irregular character, the region of the disease being much more extensively ulcerated and the bowel-wall considerably puckered.

In its other aspects the tumour, in its growth from the bowel-wall, projects as a definite mass into the canal, tend-

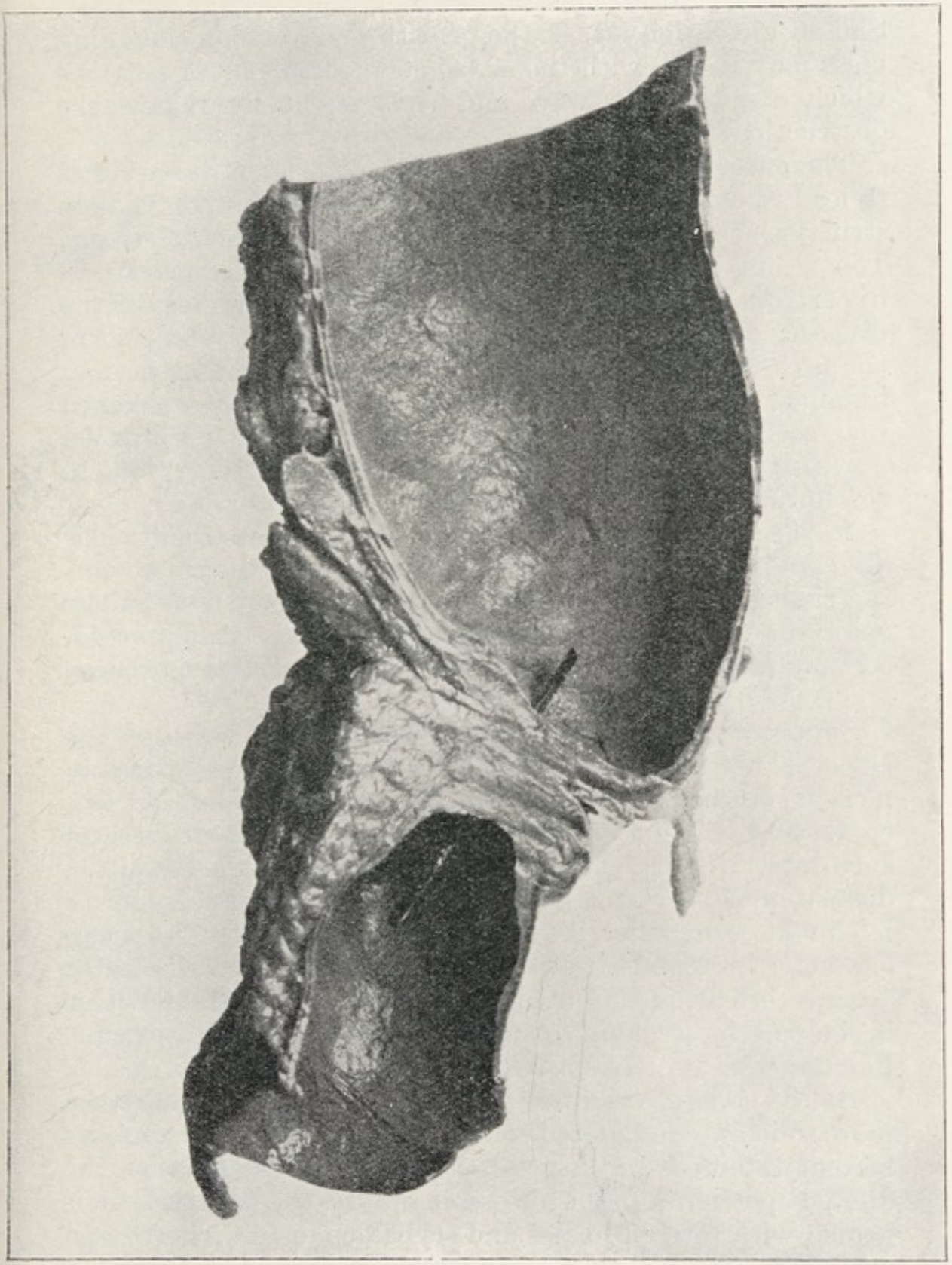


FIG. 50.—CYLINDER-CELLED CARCINOMA OF TRANSVERSE COLON.—The growth caused stricture of the bowel. The small aperture of continuity which existed is indicated by a piece of whalebone. (*W.I.M., Glas.*)

ing as it increases in size to block the passage entirely. Should ulceration attack the growth an irregular sloughing mass may result, with the occasional detachment of portions which are carried away, and so temporarily relieve the obstruction.

The effect of the growth within the bowel or its walls is to lead to other pathological lesions dependent upon the obstruction it causes and the progressive destruction of tissue. The result of the obstruction is to cause dilatation and hypertrophy of the bowel immediately above the seat of the disease; and, in consequence of the prolonged retention of the fæces in the dilated part, the mucous membrane becomes inflamed and ulcerated, and may at last get so weakened that perforation or rupture takes place. Such perforation may prove the incentive to a fatal peritonitis, or result in the formation of a fæcal abscess.

As the result of progressive destruction of tissue, adhesions are contracted between the involved part and the neighbouring tissues. This may be followed by a direct invasion by the tumour, and should destruction of tissue still proceed, communication may be established between the large bowel and some other viscus.

Suppuration in connection with malignant disease of the bowel is not uncommon, and probably owes its origin in most instances to the exposure of a raw ulcerating surface to septic infection by the fæcal contents. The effects of such infection may show themselves locally at the seat of the disease, or more remotely. In the former case abscess forms in direct connection with the ulcer, and, from its acute character, progresses until it is discharged. In the case of abscess formation at some more distant situation, the liver is the part most likely to suffer. Such cases become pyæmic in character, and this proves the immediate cause of death.

As the stricture tightens, or the obstruction increases, the more solid and undigested constituents of the bowel contents become retained, and hence it is frequently found that the dilated portion of the intestine above the obstruction is loaded with foreign bodies and scybalous masses, cherry and other fruit stones being among the commonest examples of the former. It is usually some such solid mass which, suddenly becoming impacted or blocked in the narrowed channel, gives rise to an attack of acute obstruction.

Except in the case of secondary growths it is unusual for carcinoma to attack more than one part of the bowel. Cases, however, have been recorded which seem to show that multiple involvement is possible.

Secondary growths arising from primary disease in the bowel are most frequently met with in the mesenteric glands. The liver also is often invaded. In some instances the rapid growth of a tumour in the liver becomes a prominent clinical feature.

Symptoms.—In most cases there have been symptoms dating back for periods varying between a few weeks and several months. The patient has been troubled with what has been considered indigestion or biliousness, and treated accordingly. There may have been diarrhœa, which has sometimes alternated with constipation, or the latter has been an increasingly troublesome complaint throughout. The diarrhœa which occurs is usually of a spurious kind, and is due mostly to the escape of the more fluid constituent of the fæces past the main mass of solid material lodged above the seat of obstruction. The local enteritis set up by the irritative action of this hard fæcal mass also tends to produce excretion of mucus, and excite peristaltic action of the bowel beyond. The intercurrent attacks of constipation, or possibly its unbroken continuance, is produced by the partial blocking of the constricted or contracted canal by solid fæces, which only pass with difficulty.

The solid fæces, when discharged *per anum*, present nothing out of the ordinary, except when the disease is situated low down in the sigmoid flexure, when they occasionally appear flattened or ribbon-shapened. The presence of blood in the fæces, or discharged independently, is occasionally met with. It varies considerably in quantity, being more frequently small than large, and is observed more often when the disease is located in the sigmoid flexure than elsewhere. The patient sometimes complains of tenesmus, felt more particularly when at stool.

Pain is a symptom which increases with the increase in narrowness of the canal. It is intermittent and colicky in character, depending more upon the amount of obstruction than upon the extent of the disease. Attacks of vomiting

occasionally occur, and what with loss of appetite, and often some nervous depression, emaciation soon becomes a marked feature.

Physical examination of the abdomen may or may not detect the existence of a tumour. When the disease is in the form of a stricture, it is more than likely to be masked by the distension of the bowel above. In cases where there has been prolonged chronic obstruction, the abdomen gradually becomes distended and tympanitic. In one recorded case this distension assumed such unusual proportions that it caused severe dyspnœa, and the pressure upon the vena cava produced œdema of the legs and scrotum. Palpation of the abdomen sometimes induces a visible peristalsis accompanied by colicky pains. Independently, however, of manipulation, peristalsis is often seen, especially at those times when the patient is seized with an attack of griping pain. Other sensations are often complained of. The patient is conscious of an action in the bowels which seems to work up to a certain point, and end in a sort of gurgle, indicating possibly the escape of gas through the narrowed canal.

A sudden complete block of the canal calls forth a new and acuter train of symptoms. The patient now complains of almost constant pain in the abdomen. Distension becomes more marked and peristalsis more visible. Vomiting becomes constant, and may continue until it is fæcal. The pulse is usually small and rapid, and becomes more markedly so as time progresses. The temperature may be normal. The patient's complexion is pale or sallow, with the typical abdominal expression of sunken features and dark depressions below the eyes. The rectum when examined is found empty, and when fluid is injected it returns practically unstained by fæces.

When in the course of a case of chronic obstruction fever symptoms arise, these must be taken to indicate either the commencing formation of an abscess, or the absorption into the system of some septic material, with possibly pyæmic abscess-formation elsewhere.

Another intercurrent complication of malignant disease of the bowel is perforation. This may occur at any period of the disease, and will be known, as a rule, by the great suddenness with which acute symptoms set in. The acute

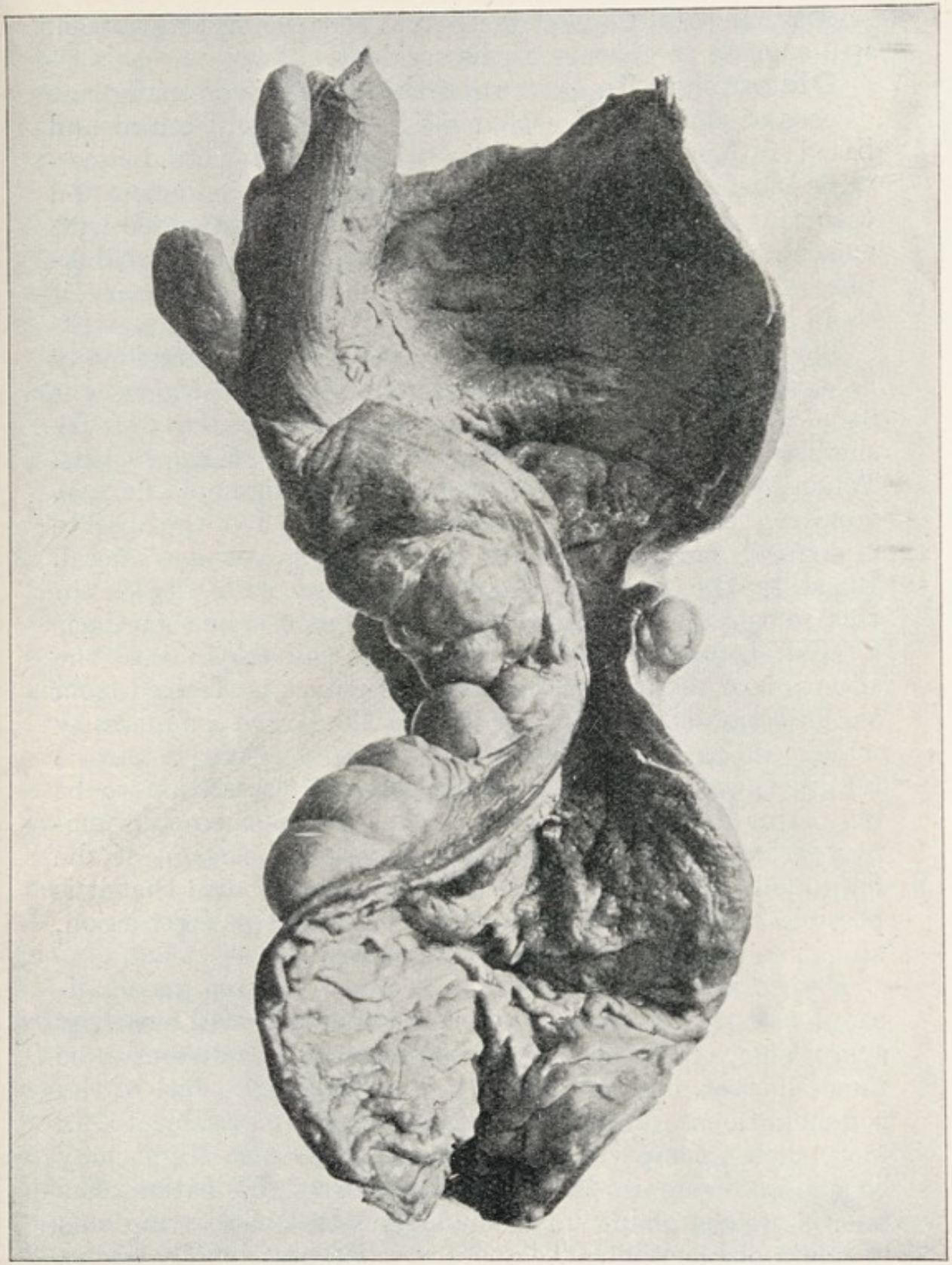


FIG. 52.—COLLOID CARCINOMA OF SIGMOID FLEXURE.—The specimen was taken from a child aged 12 years which had died of acute intestinal obstruction. The growth had caused stricture of the bowel. (*W.I.M., Gias*

abdominal pain, coupled with great collapse or prostration, will suggest the nature of the accident.

Diagnosis.—In most cases the diagnosis of malignant disease of the large bowel must be purely conjectural and based rather upon probabilities than upon actual ascertained facts. Gradually increasing difficulty in defæcation occurring in a patient passed middle life, accompanied with emaciation, will, from the simple consideration of probabilities, indicate, in the large majority of cases, carcinoma of some portion of the large intestine.

The particular seat of the disease can only occasionally be determined. When situated at the ileo-cæcal valve, it is usual for the symptoms to resemble those of disease of the smaller intestine; there are, however, exceptions to this. When the disease is situated in the sigmoid flexure, vomiting, as a rule, is less marked than when the disease is located higher up, and more rarely becomes fæcal. Blood in the motions is more frequent with disease in this part, and the shape of the solid motion is sometimes altered, being flattened. The most valuable aid to the situation of the obstruction may sometimes be derived from the injection of water *per rectum*. The larger the quantity which can be injected, and the longer the time it can be retained, the more likely is the seat of obstruction to be high up. Both auscultation and palpation should be employed in endeavouring to determine the passage of the fluid along the colon. It needs to be remembered that it is possible for the fluid to find its way past the obstruction, and in so doing to obscure the diagnosis.

Prognosis.—It is usual for death to occur in uncomplicated cases in less than a year from the onset of the earliest symptoms. In many instances the period would seem to be much shorter, but the difficulty of assigning the date of the commencement of the disease renders it impossible to fix more than a comparatively vague average. So slight may be the suffering in the early stages that the patient has offered no complaint until suddenly seized with symptoms of acute obstruction. Temporary relief occasionally occurs and deludes the patient into the belief that the disease has disappeared. The true state of the case, however, is, that the channel has been opened up by the sloughing away of an obstructing mass of tumour. In other cases, again,

relief arises from the formation of a fæcal abscess, which, bursting externally, allows of the passage of fæces from time to time through the fistula. Communications may also be established with some other part, as the bladder, stomach, or another portion of the intestinal tract.

The relative advantages to be gained by operation, and the chances this holds out for the cure of the disease or the prolongation of life, will be best discussed under the subject of Treatment.

Treatment.—This has to be considered from two aspects—the one where the symptoms are not urgent, and the other where they are; in other words, where operation is proposed at an early stage of the disease, or at some quiescent period in its progress; and where it is called for to prevent impending dissolution from intestinal obstruction.

In dealing with the first class of cases we have the most hopeful prospects, and could we but diagnose the disease sufficiently early there is but little doubt that we should be able to record some of the most successful results from the total extirpation of a carcinomatous focus.

If the disease can be located by external examination a sufficient guide exists for the line of incision, which should be carried through the parietes in a longitudinal or oblique direction over the affected area; if no such evidence can be obtained, an exploratory incision should be made in the median line, and the situation and extent of the disease ascertained. The median incision is then closed, and a second made over the affected area.

Assuming that excision is the proper course to adopt where the tumour or stricture is free and non-adherent, and the patient's condition good, the question then to decide is the kind of operation to perform. Should excision be immediately followed by end-to-end or lateral anastomosis and the bowel returned into the abdomen; or should both ends of the divided intestine not be united, but secured outside the abdomen, and the continuity of the canal established at a later period? Or, thirdly, should the tumour with the involved bowel be withdrawn from the abdomen, an artificial anus made, and the growth subsequently removed?

Each of these three methods can claim success, but the



FIG. 53. — ROUND-CELLED SARCOMA OF LARGE INTESTINE. —The tumour caused no symptoms during life. Similar masses and nodules were found in the cerebellum and in the right lung. (*W.I.M., Glas.*)

last two are apparently the safer. The second method is advocated by Paul,* who, in a very fair and impartial discussion of the question, based on practical experience, advises that immediate end-to-end anastomosis by Murphy's button should only be attempted "when the patient is in good condition, the abdomen not distended, the tumour small, and the proximal end of the bowel not greatly hypertrophied." Under the opposite conditions, Paul advocates the bringing of the ends of the bowel out of the wound, and securing them there with glass drainage-tubes inserted into both. For details of the method of operating, see Operations upon the Intestines.

There is but little difference between the second and third methods of operating. The delay, however, in removing the growth lessens somewhat the magnitude and immediate danger of the operation.

When the disease is more extensive, and more of the bowel is involved than will admit of the case being suitable for excision by any one of the three methods above described, other measures have to be carried out; either a colostomy should be performed, which of

* *Brit. Med. Journ.* 1895, vol. i. p. 1136.

all palliative measures may be considered the safest, or the ileum should be implanted into the colon below the seat of disease: in other words, an ileo-colostomy should be performed. In cases where the disease involves the cæcum, so that it is impossible to open the large bowel on the proximal side, ileostomy must be performed.

Should operation be refused by the patient, or for any other reason be deemed inadvisable, an endeavour must be made to relieve the bowels either by the administration of suitable aperients or the use of fluid enemata.

When the case to be dealt with is one of more or less acute intestinal obstruction in which immediate relief is called for, the safest plan is to perform colostomy above the seat of obstruction. If the symptoms are such as not to admit of sufficient indication on which side the bowel should be opened, the left iliac region should be first explored, and if the bowel appears collapsed the wound should be closed, and the right side opened. If perchance it should happen that the diseased segment of the gut is sufficiently free to admit of its being drawn out of the wound and secured there, it may quite safely be done; but beyond this I believe no further attempt, at this acute stage of the disease, should be made to deal radically with it. As soon as the obstructive symptoms have all passed away and the patient returned to a fairly good state of health, then is the time to consider the question of excision by one or other of the methods already referred to.

Sarcoma.—The rarity of this kind of tumour affecting the large bowel as a primary disease renders it unnecessary to allude to it more than briefly. It is said to attack the bowel usually in the form of the spindle-celled variety. Cases of myxo-sarcoma, adeno-sarcoma, and lymphadenoma have been recorded.

CHAPTER XLV.

IDIOPATHIC DILATATION. ABNORMALITIES: MISPLACEMENTS AND MALDEVELOPMENT.

Idiopathic dilatation of the colon.—Intimately associated with fæcal accumulation, if not often dependent upon it, is so-called "idiopathic" dilatation of the colon. Numerous cases are on record, both of young and old, where, from no known cause, segments of the large intestine have been enormously distended, and led to symptoms which have simulated those of obstruction, and suggested operative intervention for their relief.

As already indicated, it is possible that in some of these cases of great distension the colon has suffered as the result of chronic constipation. In others, again, it is possible that some slight kinking or twisting has caused temporary or partial obstruction, with consequent gradual distension. There are cases, however, in which the enlargement appears to be unquestionably congenital, and it is more particularly with these that the term "idiopathic" dilatation has come to be associated. A remarkable case is reported and figured by Formad* (see Fig. 54). The patient, aged twenty-nine years, had so large an abdomen that he was exhibited under the name of the "balloon man." He died suddenly from syncope, the result, it was supposed, of pressure on, or displacement of, the heart. The colon was as large as that of an ox. His chief symptoms during life was constipation.

Osler† discusses the subject from the congenital aspect, and narrates the history of three cases occurring in young children. The symptoms were generally a distended abdomen, constipation, attacks of pain, and vomiting.

Cases of dilatation existing at a comparatively late period of life have been recorded in one instance; the patient, a man, was aged 78 years.

* *Annual of the Universal Medical Sciences*, 1893, vol. i. D—28.
† *Archives of Pediatrics*, 1893, vol. x. p. 111.

In most of these cases the bowel, in addition to being greatly dilated, is also considerably hypertrophied; so that associating this state of the bowel-wall with the frequent congenital origin of the disease, it would seem reasonable to suppose that the condition was rather one of abnormal development of the part than the result of acquired pathological changes. It would, however, involve too extensive a discussion of the subject to pursue further the possible causes of this form of dilatation. It is of special interest to the surgeon purely from the clinical aspect.

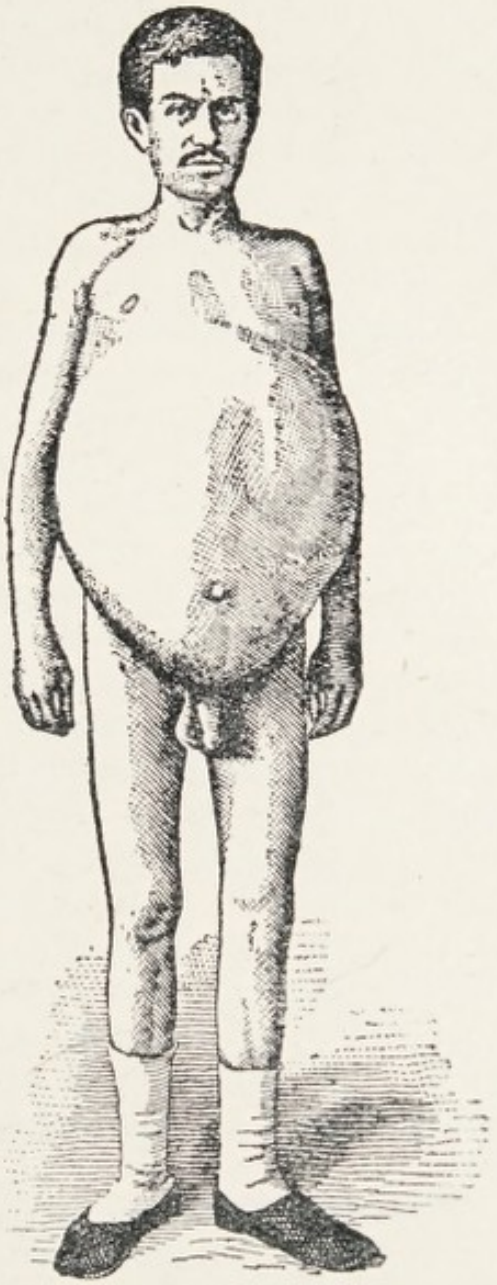


FIG. 54.—ENORMOUS CONGENITAL DEVELOPMENT OF COLON. (Formad.)

Front view, showing distension of abdomen.

Treatment.—From the cases recorded, it would appear that the most successful form of treatment to adopt in all but extreme instances is the regular use of water enemata, employed daily or at such periods as required; in some few cases aperients have answered. As long as relief can thus be obtained and no more serious symptoms develop, anything in the way of operation need not of necessity be considered.

In view, however, of such possible complications as fæcal absorption, ulceration and perforation, resulting from prolonged fæcal retention, there may be some expediency in giving relief by operation, although there may be no immediate necessity. For instance, good, rather than otherwise, might be reasonably expected from opening the

dilated bowel, emptying it of its contents, and then lessening the calibre of the canal by folding in and securing a longitudinal section of its tunics (colorrhaphy). In some instances the dilated and loaded bowel has so altered its position that the displacement more than the condition itself has been the cause of obstructive symptoms. The sigmoid flexure is the part most usually at fault in these cases. Relief has been effected either by excising the involved segment entire (colectomy) or in portion to lessen its calibre; or stitching it to the parietes, and so retaining it in its position (colopexy).

Abnormalities.—The enormous increase within recent years of exploratory operations upon the abdomen, not to speak of the performance of operations for definite purposes and more especially for intestinal obstruction, renders it imperative that the surgeon should be familiar with some of the more commonly met with misplacements and malformations of the large intestine. The additional fact also that intestinal defects may of themselves give rise to symptoms resembling other affections, renders a knowledge of them still more important.

For practical purposes it is possible to divide the abnormalities of the large bowel into misplacements and those due to maldevelopment. It is probable that similar causes give rise to both. Intra-uterine inflammation, and deficiency in the processes of normal development may conduce on the one hand to the bowel not occupying its proper position, and on the other to a congenital malformation of the part. The existence of adhesions in any particular case would suggest the possibility of some fœtal inflammation as a cause.

Misplacements.—1. *Of the whole bowel.*—Cases occasionally occur of transposition of the viscera, by which is understood the occupation of one side of the body by organs normally situated on the other. Such conditions give rise to no symptoms, and as a rule are discovered somewhat accidentally. It is not difficult, however, to conceive the trouble which might arise should for any cause operation upon the large bowel be necessary.

One of the most serious displacements of more or less of the large bowel is its passage through a congenital aperture

in the diaphragm into the cavity of the thorax. In a less marked degree this constitutes a form of diaphragmatic hernia.

2. *Of the cæcum.*—The position of the cæcum is liable to considerable variation. Lockwood,* after describing a case where it was situated opposite the crest of the right ilium, discusses, from a developmental point of view, the various situations in which, from any defect in this process, the cæcum is liable to be arrested. Thus it may be located on the left side of the abdomen; or be free in the peritoneal cavity, being held in position by a mesentery; or it may be retained close to the cardiac end of the stomach, or in the right hypochondrium; or, lastly, any way between this and the iliac fossa. Numerous examples are given in illustration of each of these abnormal situations.

3. *Of the sigmoid flexure.*—One of the commonest displacements of the sigmoid flexure is into the right iliac fossa, the bowel continuing into the rectum on the right side.

In reaching this position it is usual for the descending colon to take an oblique course across the abdomen, opposite the third, fourth, or fifth lumbar vertebra. In this form of displacement the cæcum is apt to be displaced from its normal situation, and the left iliac fossa usually becomes occupied by the small intestine.

Other rarer and more remarkable variations in the misplacements of the sigmoid are described by Melsome† in the "Proceedings" of the Anatomical Society of Great Britain and Ireland. Four examples are recorded. In three of these the variation was largely due to the greater size and length of the omega-loop.

Maldevelopment.—Included under this division is a class of cases which has already been discussed under the head of "Idiopathic dilatation of the colon." Many of these cases, it was shown, were probably congenital in their origin, and possibly due to some developmental defect.

Another class of cases exists, in which the bowel suffers

* *Brit. Med. Journ.* 1882, vol. ii. p. 575.

† *Journal of Anatomy and Physiology*, 1892–93, vol. xxvii. p. xxx.

from some abnormality in shape or structure. In this class are included pouches, sacculi, and diverticula.

Deficiency in development is sometimes met with where, as in other parts of the intestinal tract, the bowel terminates in a cul-de-sac. Such malformations constitute one of the causes of obstruction met with in the new-born, where neither gas nor fæces pass *per rectum*.

In another class of cases the bowel, instead of ending blindly, communicates by a fistulous opening with the bladder or urethra.

In one remarkable instance of maldevelopment the ascending and transverse colon were throughout but little larger than an ordinary lead pencil. The head of the cæcum was normal.

Abnormalities of the ileo-cæcal valve.—The only feature worthy of notice in connection with any abnormality of the ileo-cæcal valve is some lack of development, either partial or complete, in its two folds. The condition possibly exists more frequently than recorded examples would imply. There are no symptoms known to result from such a defect, and its discovery has only been made during life from the fact that enemata given *per rectum* have been found to produce a taste in the mouth of some ingredient contained within the injection, or that they have actually been ejected by the mouth.

CHAPTER XLVI.

EMBOLISM AND THROMBOSIS OF THE MESENTERIC VESSELS.

It may not at first sight appear what interest any obstruction to the flow of blood in the mesenteric vessels can have for surgeons. Immediately, however, one grasps the fact that to cut off the arterial blood supply to a segment of the bowel is to paralyse that particular portion, it becomes at once evident that a patient whose mesenteric artery

becomes suddenly blocked will be seized with acute obstruction.

The effect which a complete stoppage of the circulation has upon the bowel is best understood by comparing it with the more familiar and precisely similar conditions resulting from the strangulation of a loop of intestine beneath a band or through a hernial aperture. The sequence of pathological events which takes place in the latter instance has already been sufficiently described to need any further recognition here. The bowel will almost certainly become gangrenous, and perforation cause a fatal peritonitis. The condition therefore is a grave one, and calls for treatment without delay.

Embolism or thrombosis of the mesenteric vessels occurs mostly in late life, and is almost without exception, in the case of the arteries, associated with disease of the cardiac valves or with atheromatous disease of the aorta. The mesenteric vessels may be involved either at their origin, or more remotely in some of their smaller branches.

Symptoms.—Adenot,* who records a case of thrombosis of the inferior mesenteric artery producing gangrene of the colon, discusses the subject at some length. He quotes Kussmaul, who gives the following symptoms as those most frequently met with, a marked and sudden fall of temperature, violent abdominal pains of a colicky character, distension of the abdomen with tympanites, intra-abdominal effusion, and copious excessively fetid stools. He further indicates that it is possible by the character and continuous flow of blood passed *per rectum* to determine which of the two mesenteric vessels is involved. If the blood is decomposed the embolus is situated in the superior mesenteric; if on the other hand it is fresh the inferior mesenteric is involved. Again, the situation of the pain is considered of assistance. Thus when an itching and burning pain is complained of about the anus, it is the inferior mesenteric; when the pain approaches the region of the umbilicus it is the superior.

Of these symptoms the passage of blood and the rapid fall in the temperature are the most significant. The quantity of blood passed depends, however, upon the

* *Revue de Médecine*, 1890, vol. x. p. 267.

magnitude of the vessels obstructed, whether it is the main trunk or only a few of its branches.

The blood exuded may not find its way into the bowel, but may form collections in the bowel wall or in the mesentery, and should this take place to any extent it may lead to the possibility of tumour being felt through the parietes.

Thrombosis of the superior mesenteric vein.—The symptoms, while resembling those of obstruction of the artery, are usually neither so acute in their onset nor so rapid in their progress. Commencing with pain in the abdomen, vomiting soon becomes a prominent symptom, and the diarrhœa which may have existed at an early stage gives place to complete cessation of all passage by the rectum. Doubtless as the result of that portion of the bowel, whose venous system is thrombosed, losing all functional power, the symptoms of acute intestinal obstruction become more marked, the abdomen commences to distend, and the vomiting becomes fæcal. It must, however, be stated that in the few cases which have been recorded, the symptoms have not been such as to point to their real cause. In the case which I have quoted in my larger book the acuteness of the symptoms were much greater than in some of those instanced at a recent discussion on the subject at the Clinical Society of London.*

CHAPTER XLVII.

THE VERMIFORM APPENDIX. ANATOMY. APPENDICITIS.

THE vermiform appendix represents a portion of the intestinal canal which, at an early period of fœtal life, was a continuation of, and differed little from, the colon. At a later period of intra-uterine life its development ceased, and it then became merely an appendage of the cæcum, with an inherent tendency to retrogress and degenerate.

* 22 April, 1898.

As met with at birth and throughout the rest of life, it appears as a wormlike organ, variable in its shape, size, and situation, and connected with the cæcum usually on its inner and posterior surface, close below the entrance of the ileum.

Ribbert,* in his investigation upon the appendix, points out that retrogression manifests itself as age advances in three ways: reduction in length, alterations in histological structure, and obliteration of the canal. In early life it possesses a canal continuous with that of the cæcum, but in later years this connection is sometimes cut off, and in many cases partial or complete occlusion takes place. Between the tenth and thirtieth year Ribbert found that 14 per cent. of the cases examined presented partial occlusion, and between the sixtieth and eightieth year as many as 55·5 per cent. In length the appendix varies from an inch to nine and a half inches, its average length being about three and a half inches. In thickness it is about equal to a goose quill.

Attached to one border, for a variable extent, is its mesentery, which usually connects it with the ileum or is continuous with its mesentery. In the mesentery are contained the blood vessels, lymphatics, and nerves. The appendicular artery is derived from the ileo-colic branch of the superior mesenteric. It passes usually along the free border of the meso-appendix, giving off branches in its course. The nerves are derived from the superior mesenteric plexus, a derivative of the solar plexus.

In shape the appendix presents considerable variation being straight, curved, bent, or twisted like a corkscrew. These variations may in some cases be due to the shortness of the meso-appendix, in others to the undue length of the appendix.

Of most practical interest to the surgeon is the situation of the appendix. This particular part of the anatomy of the organ has been exhaustively considered by J. D. Bryant † in a valuable contribution on the "Relations of the Gross Anatomy of the Vermiform Appendix to some Features of the Clinical History of Appendicitis." The observations

* Virchow's *Archiv*, 1893, Bd. cxxxiii. p. 66.
† *Annals of Surgery*, 1893, vol. xvii. p. 164.

are based upon the examination of 144 cases. Giving only five out of the fourteen different situations recorded, the appendix was found directed upwards in thirty-four cases, behind the cæcum in thirty-two, downwards and inwards in twenty-eight, into the true pelvis in twenty-one, and upwards and inwards in nine; thus leaving only twenty cases to be allocated among the remaining nine situations. In three only of these 144 cases was the appendix situated extra-peritoneally—that is to say, it lay behind in the retrocæcal or post-peritoneal connective tissue.

In structure the appendix resembles the other parts of the intestine in possessing four coats, but differs somewhat in its minute anatomy. In most instances the peritoneum covers the organ completely; when it does not do so, the uncovered part is connected with the post-peritoneal connective tissue. The muscular coat is somewhat irregular in its distribution. Longitudinal fibres are found forming a uniformly disposed external sheath; deeper is an internal and thicker coat of unstriped circularly placed fibres combined with fibrous tissue. Between the muscular and mucous coats is a layer of connective tissue constituting the submucous tunic. Lastly, a mucous membrane forms the lining of the canal. In this latter are a number of solitary lymph follicles. The abundance of lymphoid tissue in the mucous membrane, especially at an early period of life, has led to a comparison between this part and the tonsils, and also suggested a possible source of inflammation in the organ.

In early and middle life the appendicular canal usually communicates by an aperture with the cavity of the cæcum, the mucous lining of the two parts being continuous. The presence of anything like a fold constituting a valve to the orifice of the canal is disputed.

Mucus is secreted by the lining membrane, and constitutes one of the products contained within the canal. It is interesting in connection with the question of contents of the canal to refer to Bryant's paper.* Out of 124 autopsies made for other reasons than disease of the appendix, 67 per cent. contained abnormal material; fæcal matter, either soft or hard, was present more frequently than anything

* See above.

else, being noted in 52 per cent. of the male and in 35 per cent. of the female cases. In no instances were there other than fæcal substances, or products dependent on inflammation, present in these cases. Grape seeds, cherry stones, and bodies foreign to the intestine were not found at all. As regards the relation of age to contents, from 30 years to 50 is the period of life in which material of some kind is most frequently found.

Inflammatory affections of the appendix.—Appendicitis.—A comparatively few years ago, a few lines would have sufficed to say all that was supposed of any special interest to the surgeon regarding the inflammatory affections of the vermiform appendix. Now, however, it is difficult to know how to condense within the reasonable space of a few pages what every surgeon should know, so rapid and extensive has been the advance made in this particular subject.

By appendicitis is to be understood an inflammation of the appendix vermiformis; the initial lesion may not be inflammatory, but inflammation arises sooner or later.

Pathology.—The classification of inflammatory diseases of the appendix has constituted one of the difficult questions connected with the subject, and its difficulty largely arises from the fact that what has sometimes been described as one form of the disease has been merely a stage in the process of another. If such conditions are excepted as arise from some sudden obstruction, mechanical or pathological, to the arterial supply of the organ, all other conditions may be said to be stages in the progress of some initial inflammation set up by an exciting cause most probably located within the appendicular canal. Thus a slight general inflammation of the mucous membrane would constitute a catarrh or endo-appendicitis; should this extend into the parietes it would constitute an interstitial inflammation; further progress would involve the peritoneum and produce a peri-appendicitis which may end in remaining a local peritonitis or extend and produce the general form of the disease. Further, it is not difficult to trace the possible variations which would accrue from differences in degrees of acuteness or chronicity. Thus an acute inflammation would lead to sloughing or gangrene; pus might be produced, and be pent up within the canal or form a limited abscess around the

organ. Such abscess might burrow in various directions, or burst into the general peritoneal cavity. Again, an acute inflammation, such as would cause ulceration, might lead to perforation; and should no adhesions have formed sufficient to shut off and localise the inflammatory process the peritoneal cavity would be opened into.

Other pathological lesions would depend upon the particular position occupied by the appendix. Thus its close proximity to the iliac vessels may cause phlebitis, or thrombosis of the iliac vein; or the vessels may be ulcerated into, and a fatal hæmorrhage result. When the appendix lies across the psoas muscle, inflammation may extend to that muscle, giving rise to flexion and fixation of the thigh upon the abdomen. When the appendix is long and hangs into the pelvis, it may form attachments to the bladder or rectum, and subsequently establish a communication with either. Abscesses have been known in cases of this nature to be discharged either *per urethram* or *per rectum*.

More distant lesions are sometimes found, mostly, however, of a pyæmic nature, and the result of septic absorption. Thus, instances are occasionally forthcoming of abscess formation in the liver.

Lastly, at any stage the inflammatory process may subside, leaving the parts either healthy, or in a condition to light up again with any suitable provocative. This latter class constitutes the so-called recurrent or relapsing form.

It will thus be seen how many phases a purely inflammatory process may present and how numerous become the divisions into which the disease might be divided. For practical purposes it is possible and certainly wise to attempt some sort of a classification, but it is better to remember that a pathological condition is being dealt with which, while it may assume a simple form at one peroid, may at any moment become one of extreme gravity. The best possible division would be one based on definite causes, as tubercular appendicitis; simple ulcerative appendicitis; appendicitis due to a foreign body; appendicitis from arterial embolism or thrombosis; appendicitis from kinking, torsion, or compression; specific microbic appendicitis, &c. Such a classification, however, is impossible from the fact that there are no premonitory signs, or symptoms pathognomonic of any one of these causes, nor are there patho-

logical lesions peculiar to them. Whatever, therefore, be the nature of the cause, the basis of classification must be either definite clinical symptoms or distinct pathological lesions. The latter may answer the purpose of the pathologist, but until our knowledge has considerably increased in the power of differentiating symptoms, we can probably get no further than to consider the cases under the three heads of acute, subacute, and chronic or relapsing. Even such a classification conveys but very imperfect information, for at the outset of any case we frequently cannot tell under which heading it should be classed, and, what is still more important, the name in no sense indicates the real gravity of the case. These facts will become clear as the disease is discussed.

Etiology.—The various causes which may prove the direct incentive to an attack of appendicitis have already been indicated, but a little more detailed description of them is necessary.

Many causes give rise to inflammation in the appendix which would have no similar effect in the case of the cæcum. The reason of this is probably to be sought in the natural predisposition which an ill-developed and degenerative organ possesses.

Bacillary origin.—The part played by a specific micro-organism has been much lauded of late, and, from the frequency with which the *bacillus coli communis* has been found, renders it extremely probable that the disease in many cases owes its origin to this microbe. Whether its simple presence can actually initiate the disease without the co-existence of some primary lesion in the part may be open to question; but once the part is weakened from some cause, it is more than probable that the entrance of this bacillus into the tissue of the organ lights up some or all of those conditions which are included under the general term of appendicitis. The bacillus, it must be remembered, is a constant occupant of the intestinal canal, and as such has ready access to the appendicular canal. It is therefore practically always on the spot, and ready to attack, and multiply in, any tissue that has from any cause become more or less devitalised.

In addition to this particular bacillus, others have been discovered. It is quite possible, therefore, that in some cases

inflammation has arisen from pathogenic microbes other than that referred to. But in favour of the preponderating effect of the *bacillus coli communis* is the fact that it is almost always present, and in some cases it is the only one found, it being possible to obtain a pure cultivation of it from the infected part.

Among some of the weakening causes, and therefore preparatory conditions for the entrance of the microbe, are such as interfere with the blood or nerve supply of the part. Thus any acute kinking or bending of the appendix, or torsion of the mesentery, may interfere with the blood supply. Similarly embolism or thrombosis of the vessels would effect a like result. Should any of these strangulating or occlusion effects take place at the base of the appendix, the whole organ would become gangrenous. Short of this any degree of necrosis may be met with. It is hardly possible to suppose that the mere necrosis of the whole or part of an organ so functionally inactive and useless as the appendix should give rise to serious symptoms; rather must it be that the devitalised part becomes infected and so the inflammatory process is started.

Another weakening cause is probably to be found in the irritative effects of material contained within the appendicular canal. Possibly as a predisposing or actually exciting cause the contents of the canal play but a slender part, for it has already been shown (see page 356) that it is extremely common for fæcal material to be found in appendices, in cases where there has been no lesion centring in that organ. And as regards foreign bodies, their presence in the canal must be considered rather in the light of curiosities than as playing any cogent or prominent part in the production of disease. Much difference, however, exists in the nature and consistency of the fæcal accumulations found. In most instances they are more like small lumps of putty, but not infrequently some are met with hard and almost brittle. It is not difficult to understand how these latter might in some cases prove the cause of ulceration and so create a weakened spot for the incursion of microbes.

The retrogressive tendency which the canal has to become obliterated, either partially or completely, results sometimes in the inclusion of material which sooner or later produces its deleterious influences upon the involved portion.

Extension of inflammation from the mucous membrane of the cæcum to that of the appendix probably takes place in some cases, and it is likely that in some of these cases occlusions, partial or complete, of some part of the canal results, with consequent distension and increased inflammation of the distal portion.

Indiscretion in diet and over-exertion are ascribed as causes capable of evoking a fresh attack in chronic or relapsing cases. Such a cause as the latter probably produces its effect by tearing or stretching adhesions.

Among rare cases of appendicitis must be mentioned tubercular and typhoid ulceration. Cases of antinomycosis are recorded.

The large amount of lymphoid tissue in the mucous and submucous coats may play a part in initiating the disease in certain cases. The similarity existing between these lymphoid follicles and the tonsils has led to the belief that inflammatory affections may similarly attack the former. It is possible that the supposed rheumatic origin of the disease in certain cases finds its explanation in the presence of this tissue.

A factor considered of some importance in regard to the effect it has upon the *bacillus coli communis* is the condition of the contents of the large intestine. In any disease of the bowel, but more particularly in chronic constipation, the bacillus has been found to assume a more virulent character. It is thus liable, under any weakened condition of the appendix, to infect it more readily.

CHAPTER XLVIII.

APPENDICITIS (*continued*). SYMPTOMS AND DIAGNOSIS.

Symptoms.—In the larger proportion of cases the symptoms are both characteristic and distinctive of the disease. In the matters of sex and age it shows features of marked proclivity.

Sex.—In the 169 cases recorded by Fowler* the disease occurred 142 times in males and 35 in females, that is to say, in the proportion of four of the former to one of the latter. This represents, with few exceptions, what has been found to be the ratio in other series of published cases.

Age.—The disease most frequently occurs between the years of 10 and 30. Roughly it may be estimated that 50 per cent. of the cases occur between the years of 10 and 25. One of the youngest recorded cases is that of a child aged $2\frac{1}{4}$ years, while one of the oldest was aged 68 years.

Pain.—The most prominent symptom and usually the first is acute pain, felt, in the majority of instances, at the time of seizure and for half an hour or longer after in the region of the umbilicus or epigastrium. It is likened to cramp. After fixing upon the upper part of the abdomen, it gradually diffuses itself over the entire region, and finally becomes located in the right iliac fossa. Its occurrence in this particular region renders it one of the special features of the disease.

The significance of the pain is both of pathological and physiological interest. It doubtless arises in the first place from a reflex through the mesenteric plexus, the solar plexus, and so to the spinal nerves which radiate from the lower dorsal and upper lumbar regions; but what proves the direct exciting cause is not so easy to determine. It has been attributed to the fact that the inflammation has reached the peritoneum.

Inasmuch as the pain which is latterly felt is seated over the appendix, any abnormal position of the cæcum will correspondingly affect the locality of the pain. In not a few cases this has been illustrated by pain in the left iliac fossa, and beneath the liver, the appendix having been found in these situations.

Nausea and vomiting.—Shortly after the seizure with pain the patient frequently vomits or complains of nausea. The symptom is probably more connected with the degree of acuteness of the pain than with anything else, as it usually passes off, only to return if any grave lesion

* *Annals of Surgery*, 1894, vol. xix. p. 4.

occurs, such for instance as perforation or intestinal obstruction.

Temperature and pulse.—The temperature is no fixed feature. A chill or rigor is but rarely present. In most instances there is some rise at the onset, which, however, may soon pass off, and usually does so in the course of two or three days, in cases that are likely soon to recover. A continuous rise will indicate increasing extension of the inflammation with possibly pus formation, or approaching perforation.

There are, however, numerous exceptions to such a course. Perforation has taken place when the temperature has fallen to normal; and a fetid abscess has been opened after the temperature has become reduced. A temperature, however, which continues to rise or remain elevated after the third or fourth day, should be watched with some anxiety.

The pulse as a rule, with, however, many exceptions, follows pretty much the temperature in rising at the onset, and subsiding in mild cases in the course of three or four days. In cases, however, which are progressive, the pulse shows a greater constancy in its action than the temperature. Increase of rapidity after the third or fourth day must be counted as a grave indication, notwithstanding the fact that such a rise is co-existent with a fall in the temperature. In cases of perforation the pulse rate is usually high.

The bowels.—In some cases the attack has been preceded by a period of constipation, which may give way during the first hours of the seizure to more or less diarrhœa. In other instances diarrhœa precedes the attack; while in a third class there has been no intestinal trouble.

During the attack the bowels may become constipated, but often normal motions take place. Should the inflammation extend to the cæcum or ileum so as to completely paralyse the walls of that portion of the intestine, obstruction would result with the passage of neither fæces nor flatus.

Tenderness.—A somewhat important symptom is the tenderness elicited by pressure over the seat of the disease. At the earliest stage this symptom is frequently located at one particular point, situated at the junction of a line

drawn from the umbilicus to the anterior superior iliac spine with the outer border of the right rectus (McBurney's point). Pressure at this spot causes pain of variable degrees of acuteness. As the disease progresses and inflammation extends, the area of tenderness also enlarges, and pain may be elicited by pressure anywhere over the iliac fossa and sometimes more generally over the abdomen. Any variation in the normal position of the cæcum and appendix will affect this region of tenderness, since palpation of the abdominal parietes only causes pain by reason of its direct effect upon the inflamed area.

In cases of a long appendix hanging into the pelvis, tenderness may be found on rectal or vaginal examination; but under ordinary circumstances this method of investigation affords little or no assistance.

It occasionally happens, in palpating the abdomen, that the right rectus muscle is felt to be more or less rigid. This is due to the involvement of the peritoneum lining it. Similarly, should the appendix rest upon the psoas, some inflammatory irritation of the muscle would lead to flexion and fixation of the thigh upon the abdomen.

Tumour.—Manipulation of the parietes may reveal the existence of a swelling. This is more likely to be detected if the abdominal walls are relaxed by the administration of an anæsthetic. It is a comparatively common symptom, although in many cases it may not amount to more than an ill-defined fulness or sense of resistance. When not prominent it is most probably due to the adhesion and matting of the parts, with possibly some thickening, the result of œdema. In more evident indications of a swelling, the cause is probably an abscess. Fluctuation can only be obtained when the pus is in quantity or is projecting sufficiently prominently. Where there is prolonged resistance and tenderness in the iliac fossa pus may safely be assumed to exist; and harm is only too likely to exist if any endeavour is made to elicit fluctuation.

In addition to the localised swelling in the iliac fossa, the abdomen itself is sometimes distended and tympanitic on percussion. This is probably due to some commencing peritonitis; but as the other symptoms subside, it too disappears.

The patient's general condition soon shows considerable

change. The appetite is lost, the face becomes pale, the tongue coated, and the patient presents the aspect of being acutely ill.

A symptom occasionally, though rarely, present is some pain connected with micturition. Its origin is usually due to the irritative effects of an appendicitis situated in the pelvis.

Occasionally the patient suffers from constantly recurring chills or rigors; such symptoms indicate septic absorption, and may result in abscess formation in the liver.

In progressive cases—those in which the inflammatory process does not subside after the first three or four days—other symptoms arise in connection, in most instances, with the formation of an abscess, which usually tends to find its way to the surface. The skin in the loin or inguinal region becomes reddened and œdematous, with increased tenderness. In cases where the abscess bursts without being previously opened, it may burrow between the parietal muscles and evacuate itself at some distance from the seat of the disease. In one such case I found the abscess discharging itself through an opening over the left iliac fossa. In enlarging the orifice, an aperture in the muscles was detected which communicated with a sinus leading across the abdomen to the usual seat.

Perforation of the appendix sometimes takes place in cases where the disease is supposed to be subsiding or quiescent. There is then a sudden outbreak of acute symptoms, with all the usual accompaniments of commencing acute peritonitis. The bursting of an abscess into the general peritoneal cavity will also be associated with a similar exacerbation of the symptoms.

Abscesses which burst or have been opened sometimes leave intractable discharging sinuses. The purulent matter has frequently a fæcal odour, showing that in all probability there has been or still is a fistulous communication with the bowel. In some of these cases a fæcal concretion is found at the bottom of the sinus.

Where after the lapse of three or four days all symptoms subside, it may be hoped that the patient is convalescent. However, as regards the seat of disease, one or two results may be happening: either there is a complete return to

the normal healthy condition, or there is a perpetuation of some chronic inflammatory process which will lie dormant until excited into renewed activity by some fresh agency. The cases included under this latter class constitute those known as chronic, recurrent, or relapsing.

In instances of this chronic class it is not infrequent to find that, while all prominent symptoms have disappeared, there lingers a variable degree of tenderness about the iliac fossa when deep pressure is made upon it. Or it may be that as the result of excessive exercise, or indiscretion in diet, the patient is himself conscious of some discomfort in the region. From either of these latter causes, as well as from others unknown, an acute attack is sometimes set up, when all the symptoms from which the patient suffered in the initial attack are repeated, sometimes to a less degree of severity, but as frequently to a greater.

These recurrent or relapsing attacks take place at variable intervals of time. Sometimes a patient may suffer from several attacks in a year; in others, again, the frequency with which they recur renders the patient a chronic invalid. The ultimate result in these cases it is never possible to predict. Sometimes after a series of attacks the patient ceases to be any longer troubled with a repetition; in other cases an attack finally comes which ends in acute peritonitis or acute intestinal obstruction.

Diagnosis.—Few intra-abdominal cases present less difficulty in diagnosis than those of typical acute appendicitis. A patient seized with sudden acute pain located at first in the neighbourhood of the umbilicus, and subsequently, or sometimes at the outset, in the right iliac fossa; with nausea and vomiting; with tenderness in the region of the appendix; and with some rise of temperature and acceleration of pulse, will, in nineteen cases out of twenty, be the subject of an acute attack of appendicitis. At a later stage some marked resistance or fulness may be detected in the right iliac fossa.

It is right to indicate here that in examination of the abdomen by palpation all due care and gentleness should be employed in making pressure upon the seat of disease. Where the adhesions which shut off a localised abscess are recent, they are likely to be slender and readily broken down. Hence it may easily happen that an abscess

ruptures into the general peritoneal cavity. Such an accident during examination would be marked by a sudden diminution in the feeling of resistance, and in the partial disappearance of the swelling.

The association of sudden acute pain with vomiting and nausea in cases of hepatic or nephritic colic may sometimes mislead. There is, however, in appendicitis, usually the absence of any marked distant reflex pain such as is peculiar to either of these conditions, and the tenderness in the seat of the appendix is absent in the passage of biliary or renal calculi.

Mistakes are liable to be made when the cæcum and appendix are not normally situated in the right iliac fossa. Other symptoms being typical, tenderness and pain located in the left iliac fossa, or even beneath the liver, should lead to the suspicion of an abnormally disposed appendix.

Cases of intestinal obstruction have been mistaken for appendicitis, and in some of these the great similarity of symptoms renders it very difficult, if not impossible, to differentiate.

Cases have occasionally been mistaken for typhoid fever, and as such admitted into hospital. The converse also has occurred. A careful examination, however, usually reveals the true nature of the affection.

CHAPTER XLIX.

APPENDICITIS (*continued*). PROGNOSIS AND TREATMENT.

Prognosis.—The many possibilities which exist at the outset of any appendicular attack render it impossible at this stage to predict what may be the ultimate issue. Excessive acuteness of the early symptoms does not necessarily imply increased gravity of the case; neither does mildness in their manifestation preclude the possibility of the gravest result. As regards the probabilities of perforation, this complication is far more frequent in the first attack, or its recrudescence, than in recurrent attacks.

The most favourable results may be expected, in cases of early subsidence of the symptoms, after twenty-four or forty-eight hours. If on the other hand the disease progresses, increase of the symptoms will be observed after the third or fourth day. The importance of the temperature and pulse on and after these days has already been referred to. Should both pulse and temperature fall, accompanied with a subsidence of other symptoms, a favourable result may be looked for. A falling temperature, however, accompanied by a rapid or rising pulse rate and little or no remission of the symptoms, should be considered as indicative of some gravity.

Increased tenderness or swelling in the iliac region indicates abscess formation. Evacuation of the abscess cavity may be followed by rapid recovery; there is, however, the possibility of a fistula remaining for some time. The comparatively sudden improvement which sometimes sets in, where symptoms of more or less acuteness have lingered for days, is usually due to the abscess bursting and discharging its contents into some neighbouring viscus, as the cæcum, small intestine, rectum, or bladder. Complete and permanent cure may result, although rupture into the bladder may require subsequent operation.

When the patient has recovered from an attack, the question arises whether there is a complete cure or whether some inflammatory mischief remains. It may be considered indicative of the latter result when some undue tenderness lingers in the iliac region. In such cases a recurrent attack is only too probable at no distant date. The following remarks by Treves* are of value in connection with the question of relapse: "If a large series of cases of this affection be passed in review, it will be found that the number of instances in which there has been only one attack is much greater than that in which there have been several attacks. In a certain proportion of the examples of a single attack there has been an abscess, and the great majority of the subjects of typhlitis who have passed through the stage of suppuration are thereby rendered free from any further attacks. The cause of the trouble has been removed by the suppurative process. The abscess

* *Brit. Med. Journ.* 1895, vol. i. p. 517.

cavity may apparently heal, and what is improperly called a second abscess may form; but that does not as a rule represent any fresh mischief at the original seat of disease."

When appendicitis appears during the period of pregnancy there is some possibility of abortion. But many cases are reported where the disease has been successfully treated, in some instances by appendicectomy, and the woman gone on till full time.

Prognosis in regard to operation.—From certain aspects it is possible to express a tolerably definite opinion regarding the advantage or otherwise of operations. Most difficulty arises, if not positive error, when an attempt is made to compare, *in toto*, by statistics the relative advantages of purely medical treatment, and operative. The most superficial consideration could only deduce from such data the supposed advantage of medical treatment over surgical. If a comparison of the kind were to have any practical value, every case of a certain series should be dealt with medically, and every other case of another series surgically. As a matter of fact, however, what really happens is, that the simple uncomplicated cases receive mostly purely medical treatment, while the severe and frequently complicated are relegated to the surgeon. If therefore any just appreciation of the value of operation is to be obtained, it can only be on the surgical treatment of cases which either fail to amend under medical treatment, or present features which it is deemed inexpedient to allow to run an uninterrupted course.

First as regards relapsing cases, it can be confidently asserted that the removal of the appendix will permanently remove the disease, and that this can be effected with a minimum degree of risk as regards the operation itself.

Operations performed during the acute stage of the disease for the removal of the appendix do not hold out quite such a hopeful prospect. This, however, is largely affected by the conditions that are found at the operation; much greater success attends appendicectomy performed when there are no adhesions or material exudation, than when pus is present and the parts are matted together.

Operation is least hopeful when peritonitis has already set in.

In cases of abscesses which are opened externally, the result of the operation is almost always favourable.

So far, therefore, as prognosis is affected by removal of the appendix, it may be briefly summed up by saying that appendicectomy is safest during the quiescent periods of relapsing cases; and at an early date in acute cases, that is to say, before the appendix has contracted adhesions, and before there is much exudation. It is doubtful in acute cases with suppuration more or less advanced, while it is least hopeful in general peritonitis.

Treatment.—Probably in no disease does greater divergence of opinion exist as to treatment than obtains in connection with appendicitis. Between the two extreme views of never to operate and always to operate there exists a mass of equally conflicting opinions, which renders it all but impossible to formulate any but the most general lines for guidance.

It must be remembered that the majority of cases recover. The difficulty of course is to know whether palliative efforts will prove ineffectual and when; it is the introduction of this element of doubt, together with the many grave complications that are known to arise occasionally, that has led a certain section of the profession to advocate removal of the appendix at the earliest stage of the disease.

I must own to not being one of those who advocate unreservedly and without exception the removal of the appendix within the first twenty-four or forty-eight hours. I do not deny the comparative easiness and safety of the operation when properly executed by a competent and experienced surgeon, and the inevitable security which the removal affords against any possible subsequent complication, but what I do question is the necessity of it, when considered in relation to the relief which I believe it possible to obtain in by far the larger proportion of cases by much simpler measures—by such measures, indeed, that could be carried out by any medical man. I suppose that two-thirds at least of the cases of appendicitis which are met with in practice are amongst patients in such circumstances of life that removal of the appendix straight off could not be safely executed. What assistance in the treatment of such cases are those prepared to give who believe

in no measures short of excision within the first forty-eight hours?

Let me indicate a simple line of treatment to be carried out during the *early* acute stage of the disease, that is to say, within the first day or two of the attack, which in my experience has, almost without exception, been fraught with the best results.

A copious warm water enema is given to empty the lower bowel, and if possible excite a natural movement: teaspoonful doses of sulphate of magnesia dissolved in a wineglass of warm water are given hourly until the bowels move. From six to eight doses are usually sufficient. If the stomach rejects the magnesia it should not be pressed, and five to ten grains of grey powder tried instead. A hot fomentation, or better a hot linseed meal poultice, is applied to the abdomen. The diet is restricted to small quantities of fluid and easily digested nourishment. No opium should be given by the mouth, but if the practitioner feels forced to relieve pain a hypodermic of morphia must be administered.

The sole point about this line of treatment is the attainment of a free watery evacuation of the bowels, which will tend to deplete the inflamed region, and so check the progress of that congestion which might sooner or later lead to graver inflammatory complications.

If the onset and immediate progress of the attack be such as to suggest acute intestinal obstruction or perforative peritonitis, then there is no question as to the right procedure. Operation will alone save life, and there should be no delay in its performance.

Although I cannot speak from experience, there are many who highly recommend the use of ice applied to the iliac region. It possibly has some checking influence upon the inflammation.

If, then, only exceptional complications demand operation during the acute stage of the disease, what is to be said of those cases which become chronic or relapse? Should they be operated upon?

In the first place the operation of appendicectomy, when conducted in the quiescent stage of the disease and by competent operators, has been shown to be exceptionally safe. The question of weakening the abdominal parietes

is but slight when proper attention is devoted to the primary incision.

Should appendicectomy be performed in a case which has recurred once, or should it be delayed till after a second or third recurrence, and so on? Possibly the proper way to answer the question is to consider the condition of the patient after the attack: whether there is a return to complete health, or whether there is some lingering pain, tenderness, or sense of discomfort in the region of the appendix. In the former case it is possible that another attack will not be forthcoming; in the latter it is probable it will. Hence it would appear a reasonable indication for the operation when the patient seems to suffer from persistent mischief which, if it does not keep him continually more or less an invalid, at least subjects him to attacks which will be troublesome and may at any time prove dangerous.

A somewhat more difficult question to answer is the advisability or not of cutting down upon a fulness or tumour felt to exist in the iliac fossa. Should it be allowed to progress until an abscess definitely forms and either bursts somewhere internally or there is unmistakable evidence of its proximity to the parietes, or should an endeavour be made to reach and empty it before any such evidence exists? The skill of the operator is a not unimportant factor in forming a decision, for there is much to show that a careful deep dissection may be carried out with almost as much safety as if no dissection were required. Unless the surgeon is fully prepared to meet and treat effectually such a possible and not improbable accident as the creation of a communication between the abscess cavity and the general peritoneal cavity by breaking down some soft boundary adhesions, he had better not attempt any deep dissection for a purulent collection. The risk to the patient is probably less by letting the abscess take its own course, than by his attempt to deal with it. If the abscess present marked evidence of pointing in the groin or iliac region, adhesions will probably have securely shut off the peritoneal cavity, and a sufficiently free incision may without hesitation be made into it.

As a matter of prognosis it may be said, that, notwithstanding many exceptions, inflammatory exudation, purulent or otherwise, is much more likely to subside

without causing further trouble in children than in adults.

Operation.—The excision of the appendix will be found described under "Appendicectomy" in chap. l.; but it is necessary to indicate here in detail some of the numerous difficulties and complications which the surgeon may have to encounter in operation upon the part, whether or not the appendix is removed.

These considerations may be discussed under five heads: 1. Abscesses; 2. Fistulæ; 3. Adhesions without an exudation; 4. Adhesions with an exudation; 5. Perforation and peritonitis.

1. *Abscess.*—In cases where redness and œdema of the skin over the iliac region indicates the approach of pus to the surface, but little difficulty is encountered in reaching it. The skin incision, however, should not be larger than is requisite for the free evacuation of the abscess. A too free incision might carry the opening beyond the limits of the adherent peritoneum, and so endanger the general peritoneal cavity. Any digital examination of the abscess cavity must be most cautiously carried out, otherwise limiting adhesions may be inadvertently broken down and the general abdominal cavity opened into. Nor for the same reason should any forcible irrigation of the cavity be exercised. In most instances it will be quite sufficient simply to open the abscess at its most prominent point, put in a large-sized drainage tube, and so disturb the part as little as possible. When the abscess presents most prominently in the pelvis towards the rectum it may be opened there. Any attempt to remove the appendix is sometimes difficult, and there is this to be said in favour of no prolonged endeavour to do so, that, this particular class of cases more frequently than not recover permanently, the appendix being destroyed in the suppurative process.

2. *Fistula.*—Fæcal fistulæ sometimes remain after the opening or bursting of an abscess either through the abdominal parietes or into the rectum or bladder. In the former case the fistula may be due to a fæcal concretion, the removal of which by forceps leads to rapid healing of the wound. Where no such source of irritation exists, the fistula in the majority of cases sooner or later closes. Its undue persistence may depend upon a perforated appendix freely

communicating with the cæcum and in such cases nothing but careful dissection of the region, with removal of the organ, will effect a closure of the fistula.

Where a communication exists either with the rectum or the bladder, an operation to reach these parts may become necessary. It will probably be found to be due to a perforated appendix. Removal of this, with closure of the vesical or rectal aperture, will effect a cure.

3. *Adhesions without exudation.*—Every degree of firmness may be found in the adhesions which bind the appendix to the surrounding parts. In the worst cases the intestines about the region of the appendix are so matted together that the bowel is more readily torn than the adhesions separated. In one of my own cases I was forced to excise two or three inches of the ileum. The patient, however, made a perfect and uninterrupted recovery.

4. *Adhesions with exudation.*—The presence of an exudation, purulent or otherwise, adds an additional complication to the existing adhesions. The danger in these cases is that infection of the peritoneum may be caused by breaking down adhesions which had served to limit and cut off the septic material from the general peritoneal cavity. If the cavity be comparatively small it may be thoroughly wiped dry after the removal of the appendix, and then freely dusted with iodoform. If, however, the cavity be larger and less limited, and a doubt remains in the surgeon's mind as to his having perfectly removed all septic matter, the cavity should be carefully stuffed with strips of iodoform gauze, so inserted as to be easily withdrawn in the course of forty-eight hours or so.

5. *Perforation and peritonitis.*—Treatment in these cases demands consideration not only of the seat of the disease, but also of the whole peritoneal cavity. While the former must be dealt with according to the conditions found, a free irrigation of the latter, or removal of the septic material or exudate by sponge cloths, is necessary. If it is found impossible, as it most likely will be, to deal effectually with the peritoneal cavity through the lateral incision, a median one must be made. For further remarks regarding the best method to adopt in cleansing the peritoneal cavity see the "Treatment of Peritonitis," page 302.

After treatment of operation.—This follows upon the

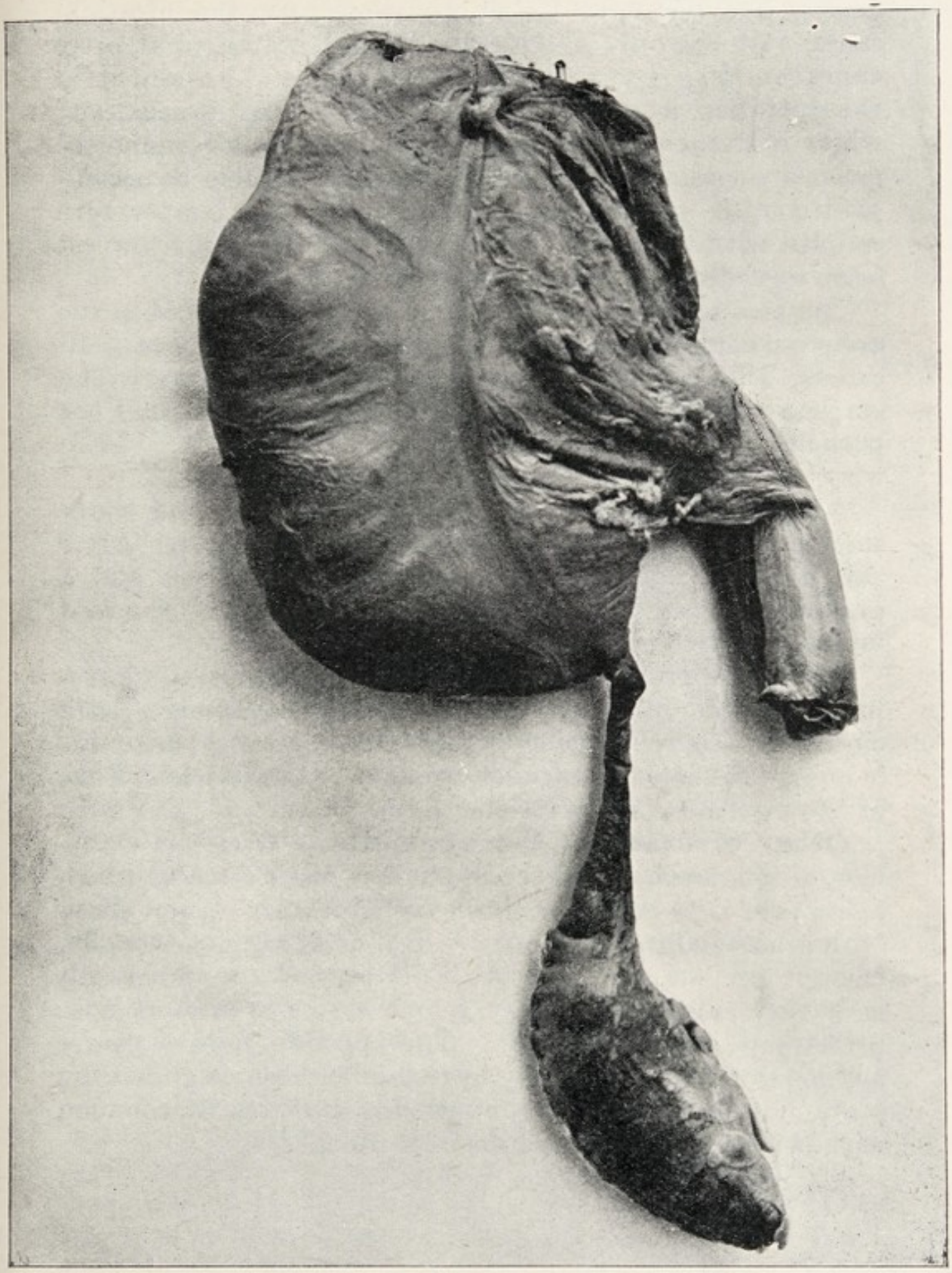


FIG. 55.—CYSTIC VERMIFORM APPENDIX. (*V.I.M., Glas.*)

general lines laid down for all operations upon the intestinal canal, with the only possible exception, however, of an early endeavour to get some action of the bowels. No sequel to the operation is more favourable than a fæcal evacuation; while obstinate constipation may prove the forerunner of general peritonitis. Should the latter symptom be accompanied with gradual rise both of pulse and temperature coupled with vomiting, the surgeon may have the gravest fears regarding the hopeful prospect of the case.

The best aperients are the saline ones administered in the same quantity and with the same frequency as above indicated. Either castor oil or calomel may be given. The surgeon, however, will often be guided best by what the patient's stomach seems most readily to tolerate. It is wise to avoid violent purgation.

As regards diet, only small quantities of warm water should be given during the first twenty-four hours. After this a little peptonised milk can be administered, and a gradual increase in the quantity and strength of the food henceforth proceeded with.

Should symptoms of peritonitis become manifest, the abdomen must be reopened and the peritoneal cavity again cleansed. There is no doubt that post-operative peritonitis is one of the most intractable we have to deal with and one of the most fatal whatever the course pursued.

Other diseases of the appendix.—With the exception of inflammation there are but few other diseases which affect primarily and exclusively the appendix. Tumours of both a malignant and innocent character are occasionally, though very rarely, met with. Kelynack, as the result of a very searching inquiry, found only two references to primary disease of the part. The appendix may of course become involved secondarily by extension from neighbouring parts, but in this the organ presents features in common with other regions of the intestinal canal.

CHAPTER L.

OPERATIONS UPON THE SMALL AND LARGE INTESTINE.

1. ENTEROTOMY.
2. ENTEROSTOMY.
3. ENTERECTOMY.
4. ENTERO-ENTEROSTOMY.
5. ENTEROPLASTY.
6. COLOTOMY.
7. COLOSTOMY.
8. COLECTOMY.
9. COLOPEXY.
10. COLOPLASTY.
11. ARTIFICIAL ANUS.
12. APPENDICECTOMY.
13. OTHER OPERATIONS.

OPERATIONS upon the bowel are numerous, but still more numerous are the methods employed in performing them. It is impossible within a comparatively limited space to do more than describe those operations, and the methods of executing them, which may be said to have attained to some degree of general recognition. Of many methods it may be truly said that they receive little more application than that exercised by the originator. An operation and its mode of execution in order to pass beyond the exclusive practice of its author, must in the first place possess all the elements of simplicity in its application, and in the second be certain in effecting the end required. Many an operation upon the bowel has to be performed at short notice, under unfavourable surroundings, with limited assistance, and often by not very experienced operators. Any method therefore which fails to give the surgeon the necessary requirements under all circumstances must be considered unsatisfactory, and cannot be expected to commend itself to more than a very limited circle.

Where various methods exist for performing one particular operation, and where the merits of one offer no very striking advantage over the merits of another, the surgeon would do

well to select one, and be prepared to practise that efficiently when occasion requires. Unless the operator be one whose practice is large in the department of gastro-intestinal surgery, to try one method after another is only too likely to end in never succeeding with any.

In the list of operations which follow, I have endeavoured to simplify their description by adopting some sort of a classification. It is not easy, however, to prevent overlapping; nor is it easy to assign a definition in certain cases where contemporary literature applies to a word more than one meaning. Thus the word "colotomy" ought to be limited to merely incising the colon for the extraction of a foreign body, &c., just in the same sense as the word "gastrotomy" is used in regard to the stomach. It is, however, often applied to what should be more strictly termed "colostomy." It is frequently, too, used to express the formation of an artificial anus. Similarly "enterotomy" is used for "enterostomy," the term signifying the establishment of a fæcal fistula in cases of acute obstruction. As, however, we now have the term "enterostomy" for this operation, "enterotomy" should be limited to a similar usage as that of "gastrotomy," that is to say, the simple incision of the bowel, with its immediate suture. The word "enterorrhaphy" lacks also in aptness and correctness of application. If it is to signify in the case of the bowel what it implies in the case of the stomach, it should mean the suturing together of a fold in the wall of a dilated intestine. It is, however, used to indicate suturing together the *cut* walls of the bowel. As nearly all operations involve more or less suturing of the edges of a bowel wound, the term becomes practically synonymous with the word "suture," and for simplicity of nomenclature it would be better to abandon it. Its ambiguity is further increased by the fact that it is sometimes used for methods of uniting the bowel other than those by suture. Another somewhat ambiguous word is "colostomy." Here, again, if it is to rank in similarity of explanation with "gastrostomy" and "œsophagostomy," the term should signify strictly the stitching of the colon to the parietal wound, and the formation of an opening in the bowel; in other words, the production of a fæcal fistula. It is, however, frequently used for the operation of produ-

cing an artificial anus, where the entire, and not the partial, contents of the bowel are allowed to escape externally.

The terms "ileostomy," "colostomy," and "sigmoidostomy" are, considered from an etymological aspect, misnomers. Their extension in usage to the formation of fæcal fistulæ is strangely out of keeping with the true meanings of the words. In the cases of the œsophagus, stomach, duodenum, and jejunum, the affix "stomy" (*stoma*, a mouth) has a correct application; but considered from the same point of view, it becomes peculiarly inappropiate to operations which have in their object, not the production of an orifice (mouth) of entrance, but one of exit (anus). The terms, however, have this advantage, that they signify operations which in all points of their performance are similar to those in which the affix has its strictly correct meaning from the functional aspect of the question.

Again, there is much confusion in the use of the terms intended to imply the junction or union of one part of the bowel to another. If the union of the stomach to the jejunum be termed "gastro-jejunostomy," then the union of the jejunum to the ileum should be "jejuno-ileostomy;" of the ileum to the colon, "ileo-colostomy." It is not, however, infrequent to find the operation spoken of in the inverse way—thus, "ileo-jejunostomy." Further confusion exists in the fact that these terms are sometimes used for two totally distinct operations, as for instance the lateral approximations and fistulous connection between two coils of intestine; and the entire implantation of the transverse section of one portion of bowel into an orifice in the lateral wall of another.

If authors would use terms which have the same relative significance in the œsophagus, stomach, and intestines, where comparisons can be drawn, the whole nomenclature of the subject would be greatly simplified, and some degree of perspicuity would exist where at present there is often much confusion.

The following list may be taken as fairly representing the more or less recognised operations upon the small and large intestine—excluding those of the duodenum, which have already been given, and those of the rectum, which will be described later.

1. Enterotomy — (*a*) Jejunotomy; (*b*) Ileotomy.
2. Enterostomy — (*a*) Jejunostomy; (*b*) Ileostomy.
3. Enterectomy — (*a*) Entero-anastomosis — (1) End-to-end anastomosis; (2) Lateral anastomosis or approximation; (3) Lateral implantion. (*b*) Artificial anus (enteric)

Methods of uniting bowel.

A. By suture.
   (1) Circular. Czerny-Lembert (Wölfler's modification of).
   (2) Abbe's method.
   (3) Maunsell's method.
   (4) Halsted's method.

B. By "plates," "tubes," or "bobbins," made of decalcified bones, etc. and by metal buttons.

4. Entero-enterostomy (short-circuiting) — (*a*) Jejuno-jejunostomy; (*b*) Jejuno-ileostomy; (*c*) Jejuno-colostomy; (*d*) Ileo-ileostomy; (*e*) Ileo-colostomy.
5. Enteroplasty.
6. Colotomy.
7. Colostomy — (*a*) Lumbar, right and left. (*b*) Inguinal (sigmoidostomy).
8. Colectomy, cæcectomy, sigmoidectomy — (*a*) Entero-anastomosis. (*b*) Artificial anus.
9. Colopexy.
10. Coloplasty
11. Artificial anus — (*a*) Cæcal; (*b*) Right colonic; (*c*) Left colonic; (*d*) Sigmoid; (*e*) Enteric.
12. Appendicectomy.
13. Other operations— Gastro-enterostomy, Cholecystenterostomy, Uretero-enterostomy, Cystenterostomy — (*a*) Gastro-jejunostomy; (*c*) Gastro-ileostomy; (*d*) Gastro-colostomy.

In describing the various operations upon the bowel it is not intended to preface each operation with the steps required to open the abdomen except in so far as they may be of a special nature in certain cases. The line of incision will be given, and anything particular regarding the division or separation of the deeper structures; but such points as the preliminary cleansing of the skin, the arrangement of

aseptic cloths or towels, the proper securing of all bleeding points, and other such general considerations as concern the proper preparation of the patient, and the place of operation, all of which have been frequently dealt with before, will not be repeated. (For illustration see page 157.)

1. **Enterotomy.**—The operation is performed for the removal of obstructive agents, such as gall stones, &c., from the interior of the small intestine. The terms *jejunotomy* and *ileotomy* imply that the operation is performed either upon the jejunum or the ileum.

Operation.—The abdomen is opened in the median line, usually below the umbilicus.

The loop of intestine containing the body to be removed is withdrawn from the abdomen, and carefully protected there with suitably disposed cloths to prevent any contamination of the abdominal cavity when the bowel is opened.

An assistant squeezes out of the intestinal loop with his thumb and forefinger such contents as can be so removed, and then clamps each portion of the bowel on the proximal and distal sides of the part to be opened, by constricting with the thumb and forefinger of each hand.

By an incision of requisite length the surgeon opens the intestinal canal in the long axis of the bowel, at the part of the wall most distant from the mesenteric attachment. The obstructing agent is extracted, any bleeding points secured, and the edges of the wound tucked in and united by a continuous Lembert suture. Care must be taken to see that the mucous membrane is well involuted. After cleansing the part, the loop is returned to the abdomen and the parietal wound closed.

The term "enterotomy" has been applied to Nélaton's operation, see below—enterostomy.

2. **Enterostomy.**—This operation is performed in the upper part of the small intestine—jejunostomy—for obstruction above, while it is performed in the lower part—ileostomy—for obstruction below. In the former case it is for the object of supplying nourishment to the patient, while in the latter it is to relieve the bowel of its obstructed fæcal contents.

The general term "enterostomy" may be suitably applied to Nélaton's operation, which is thus performed.

"The seat of the operation is the iliac or inguinal region,

preference being given to the right side. An incision is made through the abdominal parietes parallel to and a little above Poupart's ligament and to the outer side of the epigastric artery. The skin incision is recommended to be about 7 ctm. in length. The deep incision whereby the peritoneum is opened being about 4 ctm. in length. The first *distended* coil of bowel that presents itself is gently seized and drawn into the wound. If the operation be performed upon the right side it is found that the segment of intestine opened is nearly always the terminal part of the ileum. The gut is then fixed to the wound by a double line of sutures which transfix the intestinal walls. An opening is finally made into the bowel between the two lines of suture, and the operation is completed" (Treves).

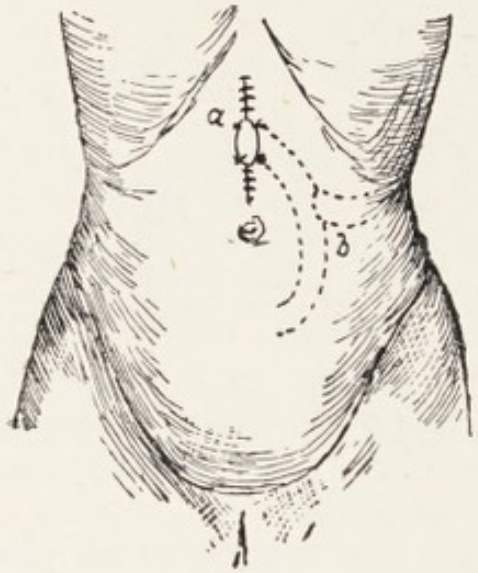


FIG. 56.—DIAGRAM OF MAYDL'S OPERATION OF JEJUNOSTOMY.

a, orifice of jejunum stitched to parietal wound; *b*, lateral implantation of upper segment into the side of the lower.

(*a*) **Jejunostomy**. — The operation isper formed for extensive disease of the stomach, when gastro-enterostomy is not possible.

Operation.—An incision is made in the middle line, between the ensiform cartilage and the umbilicus. The index finger is inserted and a loop of the jejunum hooked up. To ensure that the portion of the bowel secured is the highest part that can easily be withdrawn, it should be traced upwards till the commencement from the duodenum is recognised.

The bowel can then be stitched to the margin of the parietal wound, and left for four or five days to contract adhesions before being opened.

*Maydl's modification.**—An incision is made about 10 ctm. long in the middle line, between the umbilicus and the ensiform cartillage.

The jejunum is sought for about 1 ctm. from the plica-

* *Wiener med. Wochenschrift*, 1892, No. 20, p. 785.

duodeno-jejunalis, emptied at this spot of its contents, and surrounded by two strips of iodoform gauze which are pressed through the mesentry and tied. The bowel is then cut transversely across between the two strips. An incision about 3 ctm. long is made in the convex side of the distal segment, and into this the orifice of the proximal segment is stitched (see Fig. 56). The orifice of the distal segment is brought out at the abdominal wound, and secured there. This latter opening is reduced so as to form an orifice of only 2 ctm. in breadth.

The object of this operation, like that of Albert's which follows, is to procure a means of preventing the escape of the bile, pancreatic and gastric secretions through the intestinal orifice.

*Albert's modification.**—The incision through the parietes is the same as that of Maydl.

A loop of jejunum is brought out through the parietal wound, which is for the greater part temporarily closed. At the base of the loop a lateral anastomosis is made between the proximal and distal parts.

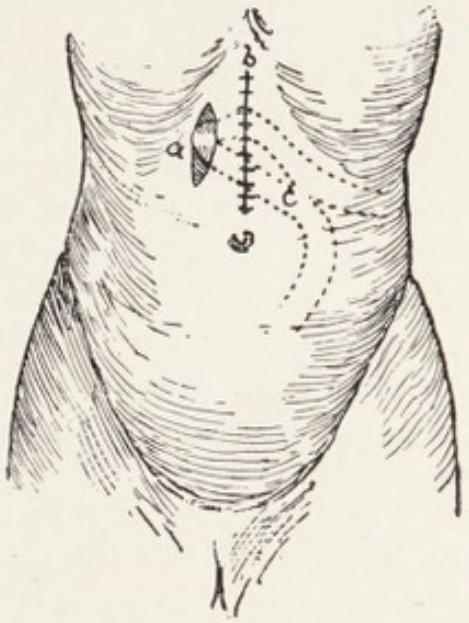


FIG. 57.—DIAGRAM OF ALBERT'S OPERATION OF JEJUNOSTOMY.

a, apex of loop of jejunum drawn out beneath strip of skin between the first incision, *b*, and the second incision; *b*, first incision closed after making lateral anastomosis at *c* (jejuno-jejunostomy) and returning the bowel into the abdomen.

Parallel to the first skin incision and 4 ctm. above it another incision is made, and a strip of skin 2 ctm. long raised. Beneath this the loop is passed and secured (see Fig. 57) (as in Franks's method for gastrostomy). The lax portion of the loop with its anastomotic portion is now dropped into the abdominal cavity, and the first parietal wound closed. On the fourth day an opening is made by means of Paquelin's cautery into the loop, and nourishment administered.

(*b*) **Ileostomy.**—This operation consists in opening the

* *Wiener med. Wochenschrift.* 1894, No. 2, p. 57.

lowest part of the ileum for extensive obstructive disease in the region of the cæcum and ileo-cæcal valve.

"An incision about 2 or $2\frac{1}{2}$ inches long is made in the direction of the right semilunar line, with its centre corresponding to a line drawn across the abdomen from one anterior superior spinous process of the ileum to the other." The ileum is sought for close to its termination in the cæcum, and stitched to the parietal wound. If the symptoms for which the operation is performed are not acute, the bowel should be left for about three days before opening it.

3. **Enterectomy.**—The operation implies excision of any part of the small intestine for tumour, disease, or injury. Except in the case of gangrene from strangulated hernia, the part of the bowel to be removed is withdrawn from the abdomen through an incision made in the median line either above or below the umbilicus.

Operation.—The involved loop of gut is retained by the hands of an assistant outside the parietal incision. The abdominal cavity is protected by properly disposed sponges or cloths.

The contents of that portion of the bowel which is to be included between the clamps is carefully squeezed out, and the intestine clamped at a convenient distance from each margin of the proposed line of section.

Methods of clamping.—Various instruments, complicated and simple, have been devised for preventing the escape of the fæces after excision of the segment.

A simple method is to pass pieces of indiarubber tubing through the mesentery at the required spots, and either knot them or secure them by means of pairs of forcipressure forceps (Fig. 22, see page 178).

Another equally simple method, and one which I am in the habit of making use of, is to slip pieces of indiarubber tubing over the blades of two pairs of ordinary dissecting forceps. One blade of each pair is thrust through the mesentery at the requisite spot, and then closed by slipping another piece of tubing over the approximated blades. The clamping can thus be rapidly performed, the bowel is not puckered as in previous methods, and the forceps can be prepared beforehand, and kept with the tubing in an antiseptic solution ready for use (see Figs. 23–26, page 178). Among special instruments, those by Makins, Lane, Treves, and Bishop

may be mentioned. In those devised by the latter two surgeons, the clamps are connected by rods which admit of their being approximated when the requisite portion of bowel has been removed.

Excision.—The bowel being clamped, it is divided at a convenient distance from the clamps either by knife or scissors. The mesentery when reached may either be

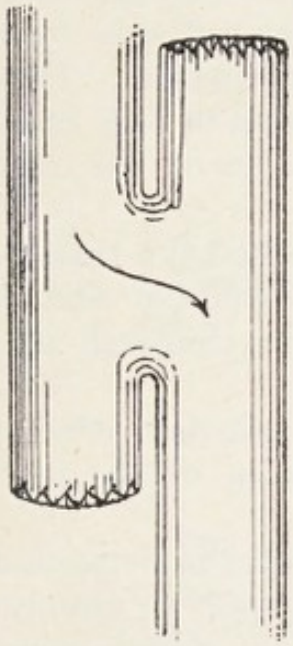


FIG. 59.—LATERAL ANASTOMOSIS OR APPROXIMATION.



FIG. 58.—END-TO-END ANASTOMOSIS.

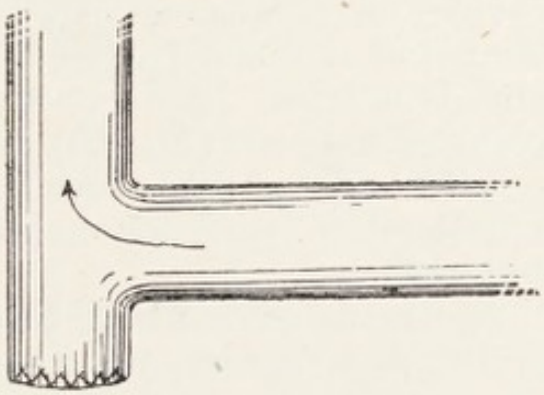


FIG. 60.—LATERAL IMPLANTATION.

FIGS. 58–60.—DIAGRAMMATIC REPRESENTATION OF ENTERO-ANASTOMOSIS AFTER ENTERECTOMY.

divided along the attachment to the bowel or a wedge-shaped piece excised. In both instances the vessels must be caught up with catch forceps and ligatured. The removal or not of a wedge-shaped piece of mesentery depends upon the length of the portion of the bowel excised and the ultimate steps of the operation. For the completion of the operation one of two steps must be taken—either the continuity of the canal is to be re-established, or it is to be permanently or temporarily interrupted by the formation of an artificial anus.

Entero-anastomosis usually consists in the re-establishment of the continuity of the canal after the operation of enterectomy, or, better, it completes the performance of

this operation; it is, however, also used to signify the union and communication of two segments of the gut without excision of any portion. There are three methods by which this end can be effected.

(1) *End-to-end anastomosis.*—By this method the canal above becomes directly continuous with the canal below (Fig. 58), the free edge of one transverse section of the bowel being united to the free edge of the other.

(2) *Lateral anastomosis or approximation.*—By this method the two ends of the divided bowel are placed side by side for a distance of some four, five, or more inches. The cut extremities are closed, but the continuity of the canal is established by lateral openings in the sides of the coapted bowel surfaces (Fig. 59).

(3) *Lateral implantation.*—By this method the transverse section of one end is closed, while the orifice of the other end is stitched to an opening made in the wall of the occluded segment (Fig. 60).

Whichever of the above methods is selected, the next consideration is the way in which the union of the parts is to be effected.

Methods of uniting bowel.—Of all the departments of intestinal surgery none has exercised such an amount of ingenuity on the part of surgeons as that which concerns the efficient union of an orifice in one part of the bowel with an opening in another. Since the time of Jobert in 1822, but more particularly within recent years, "new methods" of intestinal suturing have been constantly promulgated. How much real advance is being made by these later discoveries it is hardly possible to say; but one thing is certain, that many a so-called new method is very little more than a repetition or slight modification of an earlier one.

A. *Union by suture.*—By this method is understood the union of the bowel surfaces without the aid of any mechanical contrivances, and only by thread, gut, silk, &c. Three ways of effecting this may be instanced.

(1) *The circular.*—By this means the bowel orifices are end to end. It may be efficiently done by the Czerny-Lembert suture or this method modified by Wölfler.

The Czerny-Lembert consists in passing two separate rows of interrupted sutures around the margin of the cut

edges from without; while Wölfler's modification of the same consists in placing the first row ("Czerny's") from

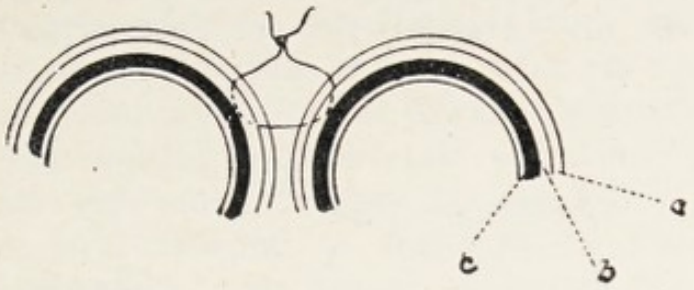


FIG. 61.—LEMBERT SUTURE.

The stitches pass through the sero-muscular tunics of the bowel wall.

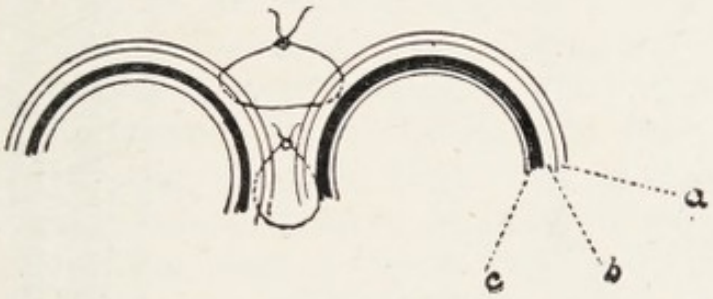


FIG. 62.—CZERNY-LEMBERT SUTURE.

The first series of stitches pass through the edges of the sero-muscular tunics and are tied externally. The second series are Lemberts.

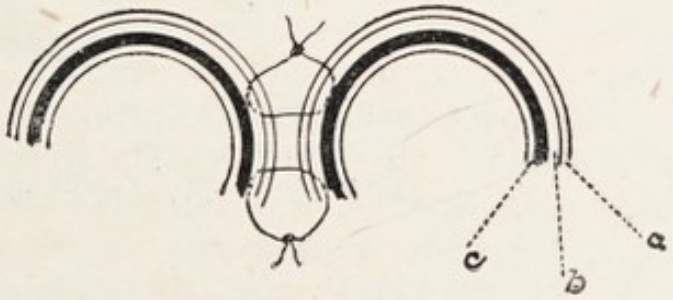


FIG. 63.—WÖLFLER'S MODIFICATION OF THE CZERNY-LEMBERT.

The stitches are the same with the exception that the first series are tied internally instead of externally.

FIGS. 61–63.—DIAGRAMMATIC REPRESENTATION OF UNION OF BOWEL ENDS BY CIRCULAR SUTURE.

a, the serous coat; *b*, the muscular coat; *c*, the mucous membrane and submucous coat.

within. Thus in the former method the inner row of stitches takes up and unites the free edges of the serous

and muscular coats, the knots when tied lying without the canal (Fig. 62); in the latter the same parts are secured, but the knots when tied lie within the canal (Fig. 63). In both methods an external row of interrupted Lembert

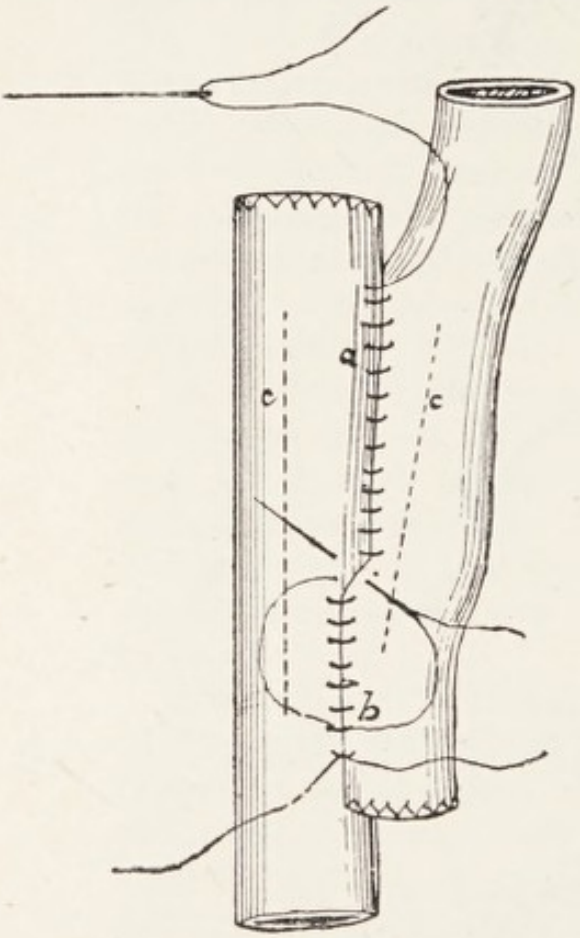


FIG. 64.—SUTURING INTESTINE IN APPOSITION BEFORE OPENING.

a, first line of Lembert sutures; *b*, second parallel line of Lemberts; *c*, line of incision into bowel.

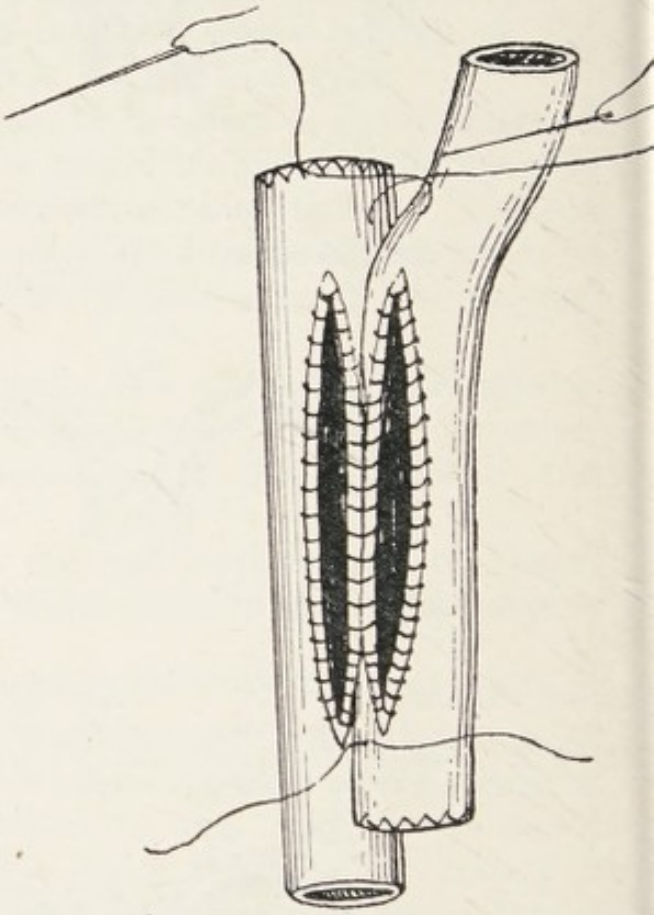


FIG. 65.—SUTURE OF EDGES OF OPENINGS PRIOR TO THE COMPLETION OF THE TWO LINES OF LEMBERTS.

FIGS. 64 AND 65.—ABBE'S SUTURE.

stitches encircles the inner series. The mesentery is united well up to the bowel, and great care should be given to the coaptation of the mesenteric edges at their attachments to the bowel.

(2) *Abbe's method of suture.**—This method is intended for cases of lateral anastomosis where enterectomy has been

* *Medical Press and Circular*, 1892, vol. ii. p. 188.

performed. The open ends of the bowel are first closed by invagination of the serous surface and the insertion of a continuous Lembert suture. The lateral surfaces are then applied to each other so that about five inches of one extremity extends alongside the other for an equal distance. A continuous Lembert stitch is passed for nearly the entire length of the applied surfaces, and upon this and parallel to it a second continuous suture is passed (Fig. 64). Both needles are left threaded at the end of the continuous series. The bowel is now opened by an incision four inches long, situated a quarter of an inch from the sutures. "Another silk suture is now started at one corner of the openings, and unites by a quick overhand the two cut edges. The needle pierces both mucous and serous coats, and thus secures the bleeding vessels, from which the clamps (previously applied to stop hæmorrhage) are removed as the needle reaches them. This suturing is then continued round each free edge in turn (Fig. 65), and all bleeding points are thus secured more quickly than by ligature. The serous surfaces around these button-holes are then rapidly secured by a continuation of the sutures first applied, the same threads being used, the one nearest the cut edge first. The united parts are again rinsed with water and dropped in the abdomen."

(3) *Maunsell's method of suturing.**—This method is employed for end-to-end union after enterectomy. The portion of intestine having been removed, both ends of the bowel are brought together by two temporary sutures passed through all the coats of the intestine. The long ends of these sutures are left uncut. One suture is placed at the mesenteric attachment of the gut, and the other exactly opposite (Fig. 66). The coats of the intestine are pinched up transversely (Fig. 66, *b*), opposite to the mesenteric attachment, between the finger and the thumb, and divided with a tenotomy knife or a pair of scissors. This opening should be made about an inch from the severed end of the *larger* segment of bowel. Its length depends upon the size of the gut to be invaginated. The long ends of the two temporary ligatures are attached to a probe

* Abstracted from the *International Journal of the Medical Sciences*, 1892, N.S. vol. ciii. p. 245.

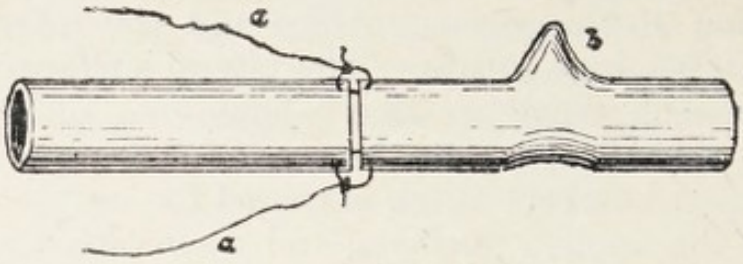


FIG. 66.

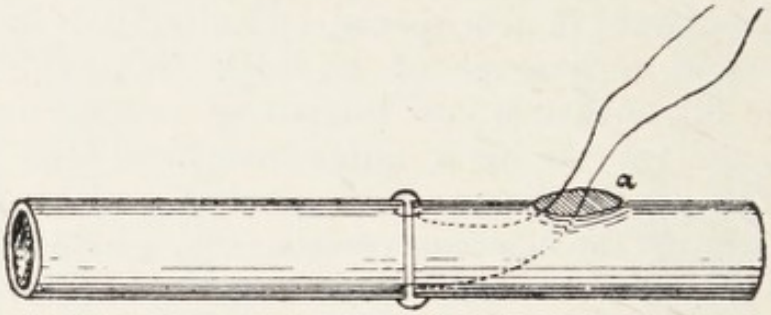


FIG. 67.

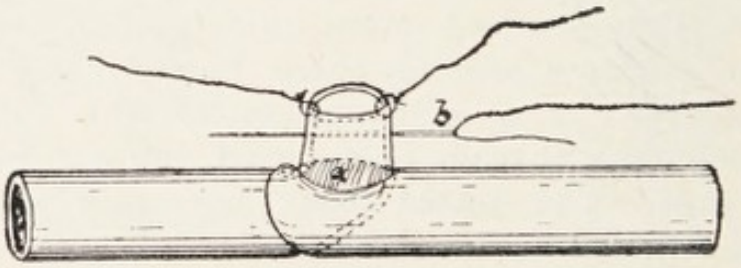


FIG. 68.

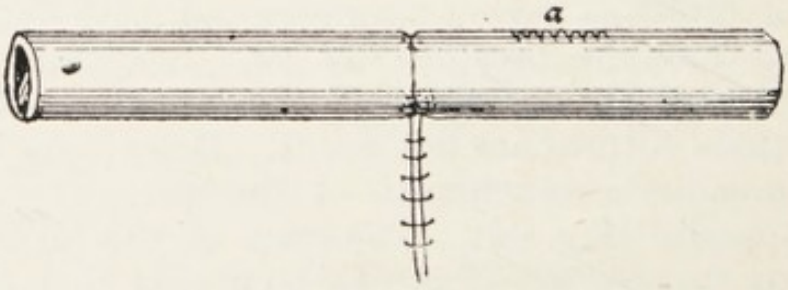


FIG. 69.

FIGS. 66-69.—MAUNSELL'S SUTURE.

Fig. 66 shows the two segments united at the mesenteric and opposite borders of the gut by the two temporary sutures *a*; at *b* the bowel is pinched up transversely prior to opening by transfixion.

Fig. 67 shows the two temporary stitches tucked in, and brought out at the newly made orifice *a*.

Fig. 68.—The temporary stitches have been drawn upon, the bowel invaginated and brought out of the orifice *a*; the needle *b* is seen passing through both walls of the gut, carrying with it the thread for tying the margins.

Fig. 69 shows the operation completed. The orifice *a* is closed with a continuous Lembert suture, and two, three or more sutures are inserted into the mesentery.

which is passed through the bowel and brought out at the incision (Fig. 67). When pulled upon they invaginate the bowel and bring out the divided extremities at the incision (Fig. 68). While an assistant holds the ends of the temporary sutures, the surgeon passes a long, *fine*, straight needle, armed with a stout horsehair or very fine silkworm gut, through both sides of the bowel, taking a good grip (quarter of an inch) of all the coats (Fig. 68, *b*). The suture is then hooked up from the centre of the invaginated gut, divided, and tied on both sides. In this way twenty sutures can be placed rapidly in position with ten passages of the needle. The temporary sutures are now cut off short, and the sutured ends of the bowel dusted with iodoform. The bowel is then pulled back. The longitudinal slit in the gut is well turned in and closed with a continuous suture (Fig. 69) and re-dusted with iodoform. One or two sutures should be put in the mesentery.

This operation is also proposed for irreducible cases of intussusception. The longitudinal incision is used for the withdrawal of the intussusceptum and the proper union of the parts about the neck of the invagination.

(4) *Halsted's method of suture.**—This method resembles Abbe's in being suited for lateral approximation. It differs, however, in the kind of suture used. After the two bowel surfaces are placed together, a series of interrupted quilt or square stitches are inserted (Fig. 70). "Six square or quilt stitches are taken in a straight row near the mesenteric borders of the selected portion of the intestine and tied. At each end of this posterior row of stitches, and nearer the convex border of the intestine, two lateral square stitches are applied (Fig. 71) and tied; a little beyond the convex border the eight or nine square stitches which constitute the anterior row and complete the oval are applied, but not immediately tied. They are first drawn aside (Fig. 72) to make room for the knife or scissors with which the intestines are then opened. Finally the sutures of the anterior row are tied" (Fig. 73).

B. *Union by plates, tubes, bobbins, and "buttons."*—By plates.—The use of decalcified bone plates introduced by

* From Jessett on *Surgical Diseases of the Stomach and Intestines*, p. 238.

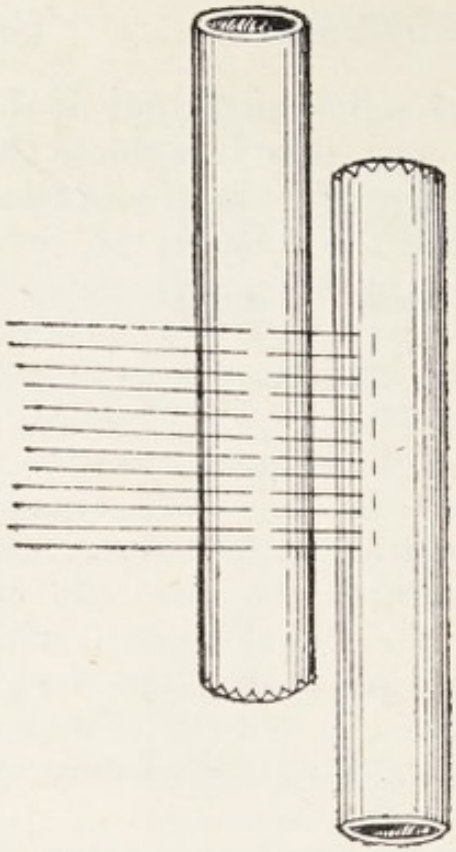


FIG. 70.—FIRST STAGE.

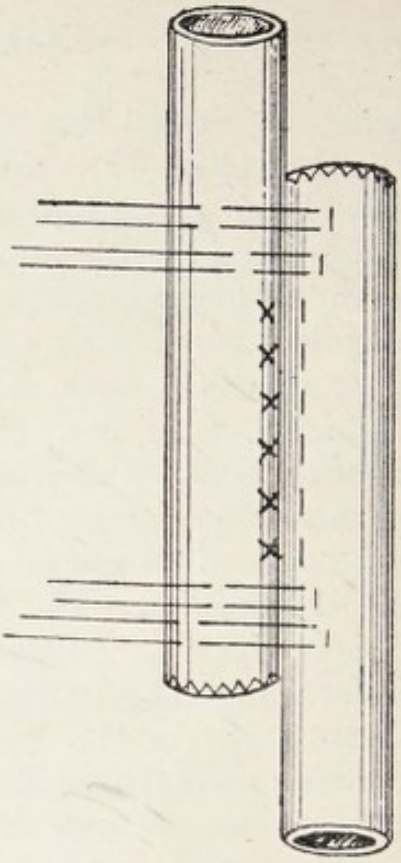


FIG. 71.—SECOND STAGE.

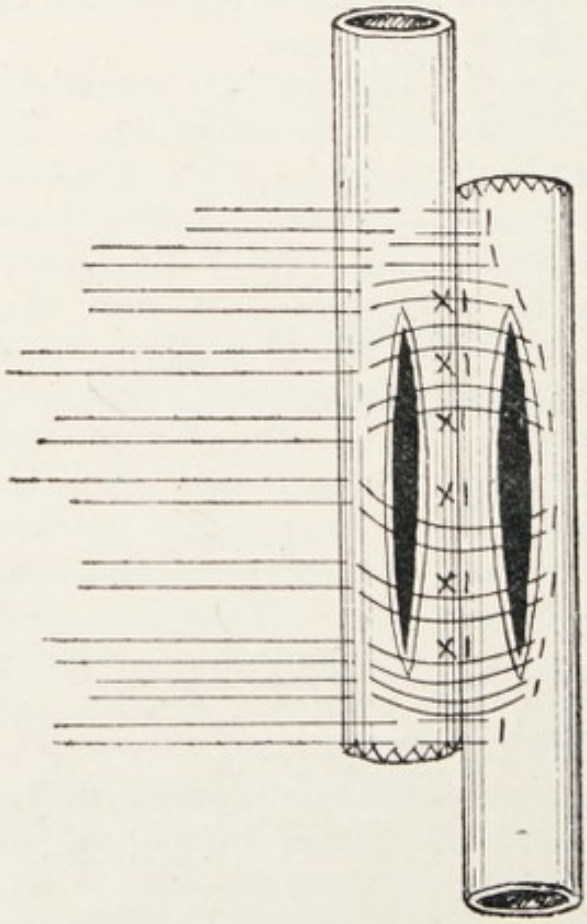


FIG. 72.—THIRD STAGE.

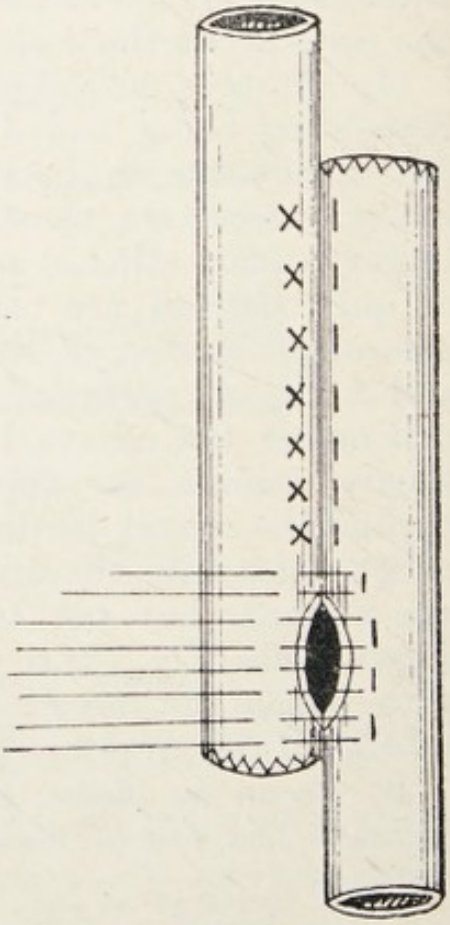


FIG. 73.—FOURTH STAGE.

FIGS. 70–73.—HALSTED'S METHOD OF SUTURING.

Senn, although it has given way to other mechanical methods, may be said to have been the first procedure of its kind to very materially shorten the operation of bowel anastomosis. For the mode of using and preparing the plates and also for many other different procedures employed in uniting the bowel end to end or laterally, which I have not space to introduce here, I must refer the reader to my larger work, where by description and diagram I have discussed them somewhat fully.

Union by decalcified bone bobbins.—This method, proposed by Mayo Robson,* is for either end-to-end union or lateral approximation.

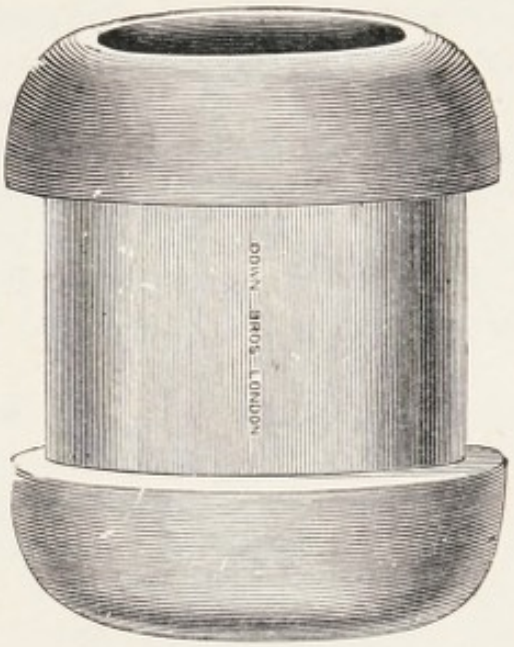


FIG. 74.—ROBSON'S DECALCIFIED BONE BOBBIN. (Full-size.)

The author in his earlier operations used two continuous sutures, a marginal and a serous. More recently he has not "hesitated to employ one continuous stitch to unite the whole thickness of the gut where time was an object in the case." In employing a single suture for end-to-end union, a silk thread eighteen inches in length is threaded upon a curved sewing needle; the posterior margins of the two visceral openings (in cases of enterectomy) are united from right to left, the suture including mucous membrane, the tail of the suture being left long on the right side and kept threaded on the left. The bobbin (Fig. 74) is now inserted, one end being in each segment of the bowel. The suture is then proceeded with around the front until the tail of the suture is reached. The two ends are then drawn tight, tied, and cut off short, and the operation completed.

When a second continuous suture is used in cases of lateral approximation this constitutes the serous suture, and is applied about half an inch from the place where the viscera are to be opened. The posterior is passed between

* *Brit. Med. Journ.* 1893, vol. i. p. 689; also 1895, vol. ii. p. 963.

the contiguous serous surfaces first, both ends being left long, so that after the viscera are opened and the bobbin inserted, the suture can be continued around. When drawn tight it completely shuts in the marginal or mucous suture.

The bobbin shown in the figure is the second largest in size. Three other smaller sizes are in use.

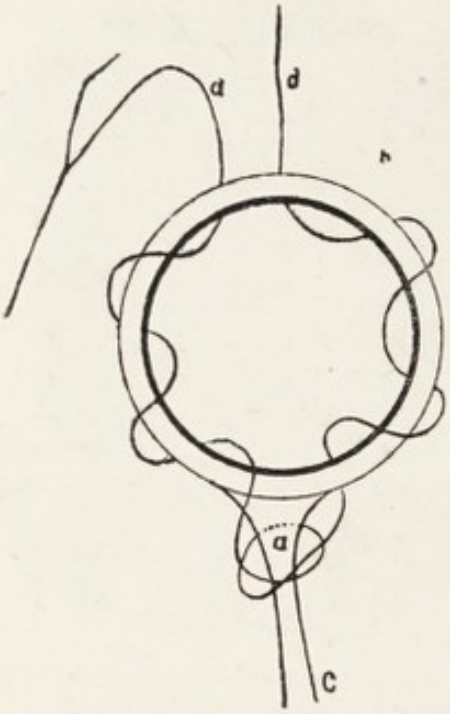


FIG. 75.



FIG. 76.



FIG. 77.

FIGS. 75–77.—MURPHY'S METHOD OF UNION WITH METAL BUTTON.

Fig. 75 shows manner of inserting thread in end-to-end union: *a*, double turn of the thread through the mesentery; *b*, peritoneum; *c*, mesentery; *d*, ends of thread. Figs. 76 and 77 show running thread before and after incision of bowel in lateral anastomosis.

Union by metal buttons.—By this method either end-to-end or lateral union can be effected. It owes its origin to Murphy,* by whose name the buttons are generally known. Four sizes of these buttons are in use—No. 1, which is $\frac{3}{4}$ inch in diameter; No. 2, $\frac{13}{16}$ inch; No. 3, $\frac{15}{16}$ inch; and No. 4, 1 inch. End-to-end, side-to-side, and end-to-side of the small intestine should be made with button No. 3. End-to-end and side-to-side of the large intestine should be made with No. 4. (See Figs. 27 and 28, page 181.)

* *Lancet*, 1895, vol. i. p. 1042.

In effecting end-to-end union the suture is made to pass around the cut margin of each end of the bowel, as shown in Fig. 75. The double turn through the mesentery tends to ensure efficient occlusion of that part of the coapted bowel margins. The two halves of the button are then inserted, and the "puckering-string" is drawn tight. The union is completed by pressing the two portions of the button together. Care must be taken to include the free edges of the bowel between the two halves. The compressed tissue sloughs and comes away with the button, and an opening as large as the button remains.

In effecting lateral union much the same process is gone through. After the "puckering-string" has been passed (Fig. 76) and incisions of sufficient length made in the long axis of the bowel, one half of the button is placed in each viscus, the string drawn up and fastened, and the halves of the button pressed together.

"When returning the bowels to the abdomen, they should be placed in parallel lines, especially at the seat of approximation, to prevent sharp curves and obstruction."

4. **Entero-enterostomy (short-circuiting).** — This operation is performed when it is impossible to remove the diseased portion of the bowel. It consists in the lateral approximation of two segments and the formation of a fistulous communication. When the operation consists in uniting one portion of the jejunum to another, it is called "jejuno-jejunostomy;" when the jejunum to the ileum, it is called "jejuno-ileostomy;" when the jejunum to the colon, "jejuno-colostomy; when one part of the ileum to another "ileo-ileostomy," and when the ileum to the colon "ileo-colostomy." These same terms are frequently applied for what has already been described as lateral implantation; but when so employed, the analogy is lost between these operations and gastro-enterostomy. To effect this method of anastomosis, either sutures, such as Abbe's, may be employed, or some of the mechanical methods by "plates," "buttons," or "bobbins." Reference to these methods, given above, will sufficiently indicate the mode of operation in cases suited for entero-enterostomy.

5. **Enteroplasty.**—This operation is for the treatment of simple stricture of the small intestine, and is intended to be adopted in place of enterectomy for these cases. The

operation resembles in every respect that of the Heineke-Mikulicz operation of pyloroplasty (see page 191).

6. **Colotomy.**—This operation, like that of enterotomy, gastrotomy, and œsophagotomy, consists in an incision into the canal for the extraction of any foreign or obstructing material and the immediate closure of the wound.

The incision is made into any part of the large intestine, immediately over the seat of the object. The incision is in the long axis of the bowel, and at its convex border—that is to say, equidistant on each side from the mesentery. After removal of the object, the wound is closed by a continuous Lembert suture, due care being exercised to properly involute the cut margins.

The term "colotomy" was always, and is now frequently used for the operation, which is often and much more appropriately designated "colostomy."

7. **Colostomy.**—The object of this operation is to form a fæcal fistula in the large bowel, although the practical result may, in some cases, be an artificial anus. When made in the lumbar region, it constitutes, according to the side, a right or left lumbar colostomy; when in the inguinal region, an inguinal or iliac colostomy; and when the sigmoid flexure is opened, sigmoidostomy.

The operation is usually performed for some obstruction below, either in the colon or in the rectum; and also in certain diseases of the colon and rectum, where it is desirable to irrigate and medicate the segment of the bowel below the artificial orifice.

(*a*) *Lumbar colostomy.*—When performed in the right loin, this operation is known as Amussat's, and the skin incision is transverse; when in the left loin, it is called Callisen's, and the skin incision is vertical. Bryant, who is one of the strongest advocates for this operation, prefers an oblique incision in whichever loin the bowel is to be opened. The steps of this operation are thus described by this surgeon:*

"The operation can be performed as follows, on the left loin: The patient is to be placed on his right side with a pillow beneath the loin, in order to arch somewhat the left

* *The Practice of Surgery*, 2nd edit. vol. i. p. 633.

flank, and turned two-thirds over on his face; the outer border of the quadratus lumborum muscle can then be made out, as this muscle is the surgeon's main guide. Its outer border with the descending colon is to be found half an inch posterior to the centre of the crest of the ileum, the centre being the point midway between the anterior superior and posterior superior spinous processes. . . . An incision is then to be made four or five inches long, beginning an inch and a half to the left of the spine below the last rib, and passing downwards and forwards parallel with the crest of the ileum; the line of the incision should pass obliquely across the external border of the quadratus lumborum muscle about its centre, so as to take the same direction as the nerves which traverse this part. By this incision the integuments and muscles and fascia are divided, and the outer border of the quadratus muscle exposed. The abdominal muscles can be divided to give room, and this had better be done upon a director. All vessels are now to be secured. The transversalis fascia will next come into view, and beneath this will be the colon, a layer of fat sometimes intervening. The fascia is to be opened with caution, for in the loose fat and cellular tissue the colon is to be found; when distended, the bowel comes at once under the eye on dividing the fascia, but when empty some little trouble may be experienced in hooking it up with the finger. It can always be found in front of the lower border of the kidney. This organ should consequently be sought, as it is the only certain guide to the bowel. . . . When the bowel has been caught, it should be partially rolled forward in order to expose its posterior surface, for, if this be not done, there is a risk of the surgeon wounding the peritoneum where it is reflected from its anterior surface on to the abdominal wall.

"The bowel, having been drawn up to the wound, is then to be secured to the integument, and not to the muscles, by the passage of a ligature introduced through one margin of the wound, then through the bowel, and lastly through the other margin. The bowel can then be opened by a longitudinal incision about three-quarters of an inch long over the ligature that has traversed its canal; the centre of the ligature is then to be drawn out and divided, the two halves of the ligature fixing the two sides of the divided intestine

firmly to the margins of the wound; and two or four more stitches may then be introduced to make the artificial anus secure."

(*b*) *Inguinal colostomy. Sigmoidostomy.*—To open the colon in either the right or left inguinal region, an incision from two to three inches in length is commenced just external to the line of the deep epigastric (marked by a line drawn from the femoral artery to the umbilicus), and upwards and outwards, parallel to Poupart's ligament, and about an inch or an inch and a half above it.

After opening the peritoneal cavity, the forefinger is inserted to bring up the colon to the wound. That the bowel thus secured is the large intestine is known by the presence of longitudinal bands and appendices epiploicæ, and by its sacculated appearance. To maintain the bowel in position while it is being stitched, two temporary traction sutures may be inserted, one towards each end; these pass through all the coats, and can be left in as guides for the subsequent opening of the gut. By a continuous suture, or several interrupted ones, the margins of the parietal wound are stitched to the sero-muscular coat of the bowel. If there is no urgency in the case, nothing further is done, and the wound is left for three or four days, in order to get a firm union between the bowel and the parietes. An opening is then made with scissors or a knife, the two traction-strings being pulled upon to act as guides for the line of the incision.

In this operation no attempt is made to form a "spur," nor to check in any way the passage of fæcal matter from the part of the canal above the opening into that below it. This latter object, when required, is effected by the formation of an artificial anus, and differs from any form of colostomy which merely seeks to establish a fæcal fistula.

8. **Colectomy.**—This operation implies the excision of some portion of the large intestine for disease or injury. When the cæcum is removed the operation is termed "cæcectomy," and when it is the sigmoid flexure it is called "sigmoidectomy."

Operation.—The skin incision is made according to the supposed seat of the disease; when located in the more frequent localities, as the cæcum or the sigmoid flexure, the

incision through the parietes is the same as that given above for inguinal colostomy: when in the ascending or descending colon, along the outer border of the rectus muscle: and when in the transverse colon, in the median line above the umbilicus.

After opening the peritoneal cavity sufficiently freely to admit of the affected portion being well drawn out of the parietal wound, the bowel is clamped and the operation proceeded with in the same way as has already been described in the case of the operation of enterectomy. (See page 384.)

The next stage, after removal of the affected portion, consists in one of two procedures—either some form of union is effected, with re-establishment of the continuity of the canal, or an artificial anus is formed. If it is proposed to unite the ends of the bowel, then one of the methods already described must be adopted. As a practical guide to the surgeon in deciding what course he should pursue, the following advice given by Paul may be quoted here: "When the patient is in good condition, the abdomen not distended, the tumour small, and the proximal end of the bowel not greatly hypertrophied, immediate approximation by Murphy's button may be attempted. But when the opposite of these conditions prevails, the ends of the bowel should be brought out."

Although Paul specially advocates the use of Murphy's button, success has followed the employment of suture, Robson's bobbins, and some of the other mechanical measures. In cases where it is deemed advisable to make an artificial anus, the following method of performing colectomy, as advocated by Paul, may be employed:

*Paul's operation.**—"Make a sufficiently free incision over the site of the tumour. Having cleared away any adhesions, ligature the mesentery with the help of an aneurysm needle, and divide it sufficiently to free the bowel well beyond the growth on each side. Let the loop of bowel containing the growth or stricture hang out of the abdomen, and sew together the mesentery and the adjacent sides of the two ends" (as shown in Fig. 78). "The stump of the mesentery lies beneath the bowel,

* *Brit. Med. Journ.* 1895, vol. p. 1139.

where, if deemed advisable, it can be drained by packing antiseptic gauze down to it. Ligature tightly a glass intestinal drainage tube into the bowel above and below the tumour, and then cut away the affected part. Do not

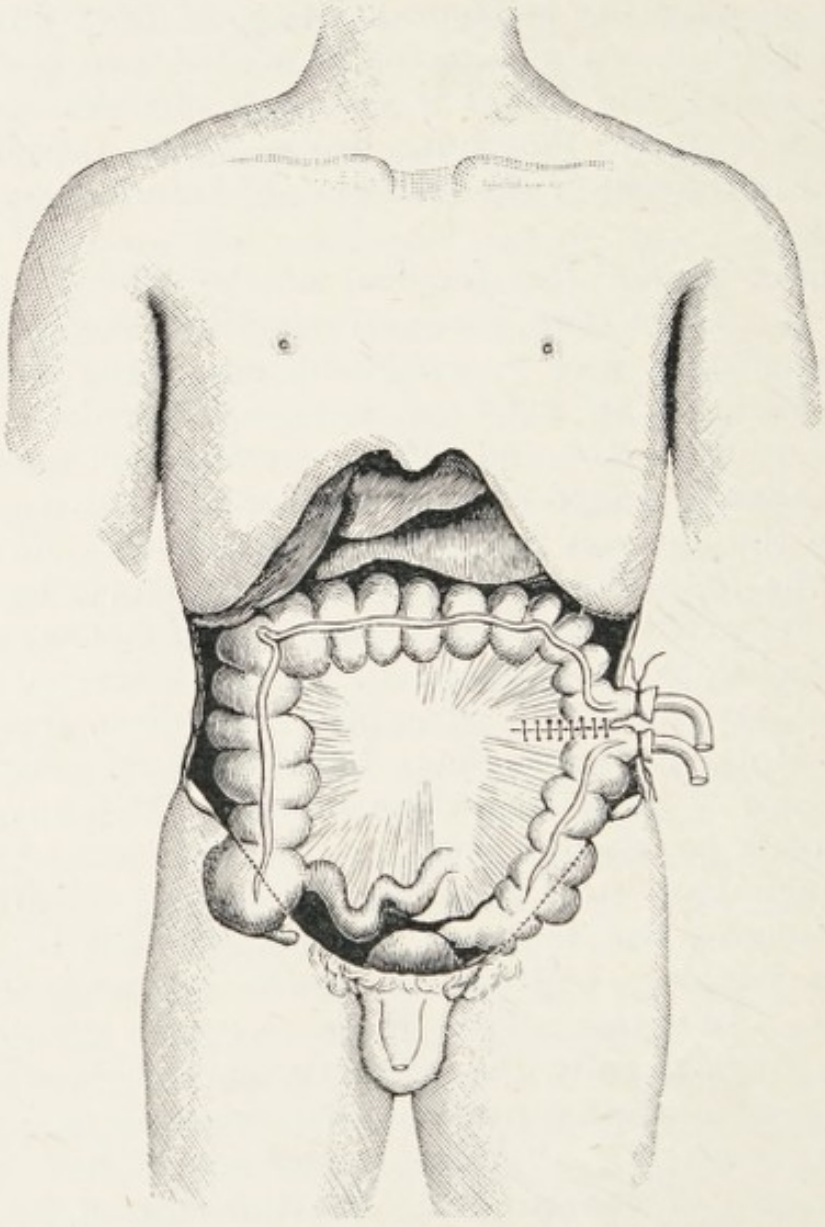


FIG. 78.—PAUL'S METHOD OF PERFORMING COLECTOMY.

Preparation of the bowel for the subsequent safe removal of the spur.

cut off first, or blood will be unnecessarily lost. Only the proximal tube is really necessary. The distal end may be closed or included in the proximal ligature. Close the ends of the wound with a few silkworm-gut sutures, passing through all the layers of the abdominal wall; no others

are necessary. . . . The second stage of the operation—that of breaking down the spur with an enterotome—should generally be undertaken about three weeks later. As soon as this has been satisfactorily accomplished the artificial anus is closed by separating the rosette of mucous

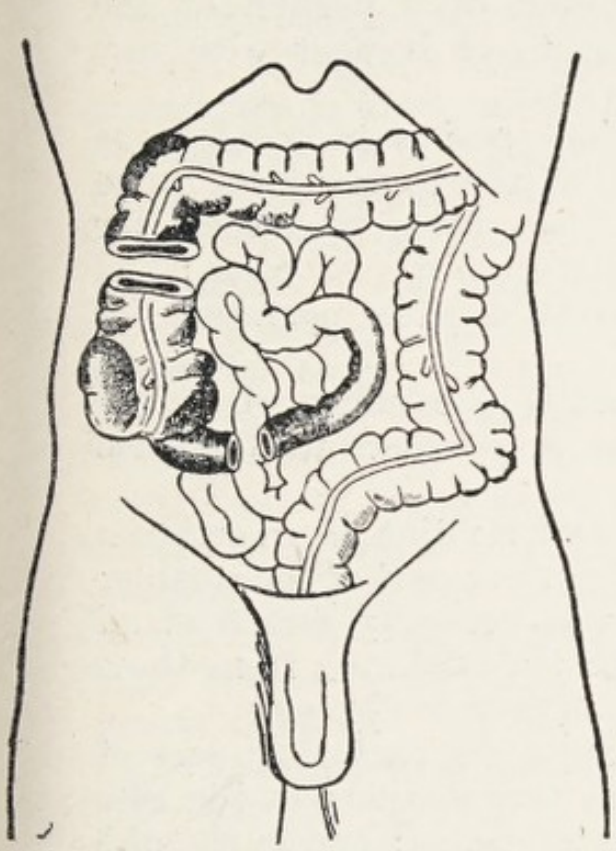


FIG. 79.—IRREDUCIBLE CHRONIC ILEO-CÆCAL INTUSSUSCEPTION. BEFORE OPERATION.

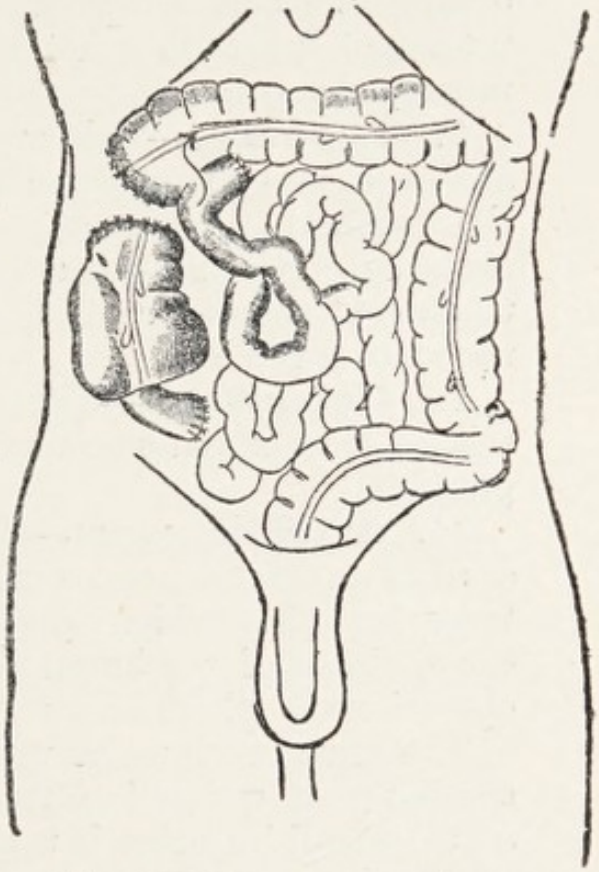


FIG. 80.—IRREDUCIBLE CHRONIC ILEO-CÆCAL INTUSSUSCEPTION. AFTER OPERATION.

FIGS. 79 AND 80.—SHORT-CIRCUITING WITH OCCLUSION OF A PORTION OF THE INTESTINE. (Baracz.)

membrane from the skin, turning it in, and bringing the freshened edges of the latter together over it."

Another method of performing colectomy is to retain the coil of intestine with its affected area outside the parietal wound until adhesions have sufficiently shut off the peritoneal cavity, and then excise. When the obstruction caused is acute, an opening is made into the bowel above the seat of obstruction, and so relief afforded by the formation an artificial anus.

An operation for which there exists no special name, but

which somewhat nearly approaches enterectomy, has been successfully practised by Baracz.* It consists in severing the continuity of the canal in cases where the diseased segment cannot be removed, and uniting together the unobstructed segments thus freed. The operation will be best understood by reference to the accompanying diagrams. The complete exclusion of a portion of the intestinal tract does not appear to be fraught with any untoward results.

9. **Colopexy.**—This operation consists in opening the abdomen, and fixing some part of the colon by suture to the parietal peritoneum. It has been performed for prolapse of the rectum; for dilated misplaced colon; and to prevent the re-formation of volvulus after operation for untwisting the loop.

10. **Coloplasty.**—This operation resembles in every respect that of enteroplasty, and is performed for the same purpose.

11. **Artificial anus.**—By the formation of an artificial anus is understood an opening into any part of the small or large intestine which entails the necessary escape of *all* the contents of the bowel above; thus differing from those operations in which only a portion may be ejected.

The anus receives its name from the particular part of the bowel of which it forms the termination; in the case of the small intestine it is an enteric anus; and in the case of the large, a cæcal; an ascending, a transverse, or descending, colonic; and a sigmoid, according to the anatomical segment implicated.

The operation is performed for all kinds of obstruction, whether acute or chronic, and the most frequent seat for its performance is the left inguinal region. The operation is frequently termed either "inguinal colotomy" or "inguinal colostomy." With equal inappropriateness has the term "sigmoidostomy" been used.

Sigmoid anus.—An artificial anus in the sigmoid flexure is most frequently made for obstructive disease in the rectum or lower part of the sigmoid flexure.

Operation.—The skin incision and the first steps of the operation to secure the sigmoid flexure are the same as

* *Centralblatt für Chirurgie*, 1894, No. 27, p. 617.

those for the operation of sigmoidostomy (see page 398). When the loop has been withdrawn from the parietal wound it is to be secured in position, and so maintained until firm union is established between the layers of the visceral and parietal peritoneum. At the end of the third or fourth day this has taken place, and the operation is then completed by opening the bowel, and thus forming the anus.

Such is briefly the operation. There are, however, several details which need attention, and the carrying out of these has called forth many methods of operating. These various details may be thus enumerated: (1) Difficulty in finding the bowel; (2) whether the loop is twisted; (3) fixation of the bowel; (4) prevention of prolapse; (5) prevention of involuntary evacuations; (6) subsequent contraction of the orifice.

(1) *Difficulty in finding the bowel.*—Cripps adopts the following plan: "If the bowel does not immediately present itself, it is best found by passing the forefinger deeply into the abdomen, and feeling for the brim of the pelvis, and by sweeping the finger along the brim the upper part of the rectum can be felt passing over it, and by keeping the finger in contact with this, it will guide the operator to the sigmoid flexure."

(2) *The twisting of the loop.*—To determine whether the upper part of the loop is the proximal segment, pass the finger along the bowel surface into the abdomen, and note whether the gut then courses upwards or downwards; if upwards there is no twist.

(3) *Fixation of the bowel.*—If the mesentery is long enough to admit of the loop being withdrawn, its return into the abdomen may be prevented in several ways. I know of no simpler or more rapid plan than that of transfixing the mesentery immediately below the bowel wall with a small glass rod, which when passed rests on the skin of the abdominal parietes on each side of the wound. This method of transfixing the mesentery was first introduced by Maydl, who used a hard rubber cylinder covered with iodoform gauze. Since then, other similar modifications have been introduced.

Whether any stitches should be passed between the bowel wall and the skin edge after securing the mesentery will depend upon whether the bowel is to be opened at once or

left for a few days. In the latter case none need be inserted, but in the former, careful coaptation should be aimed at in order to prevent the possibility of any deep peritoneal contamination.

(4) *Prevention of prolapse.*—One of the most troublesome sequels to the formation of an artificial anus is the tendency of the bowel to prolapse through the opening. It may be the upper or lower segment which tends to project, but much more frequently it is the former. The most radical measure for the prevention of prolapse is to draw the gut out of the wound and pull upon till it is taut both above and below—in other words, the slack portion of the gut is pulled out. This is then fixed to the skin edges by suturing. In two or three days the gut is opened to allow the exit of fæcal gas; and in a week or so all the gut outside of the belly is removed close down to the skin.

(5) *Prevention of involuntary evacuation.*—Unfortunately there exists no certain means of preventing the escape of the fæces through the artificial anus. All mechanical contrivances, such as plugs, have proved failures. When once peristaltic action sets in, no artificial measures can check the fæcal outflow. Something may be done by keeping the fæces solid, and so regulating them that a movement may be expected at a more or less definite time, once in twenty-four hours.

With the object of trying to obtain some voluntary control two methods have been recently tried, with more or less success, to utilise the normal contraction of the abdominal muscles for the purpose. Thus, by one method, the bowel has been led obliquely through the parietal muscles; so that in addition to muscular contraction a truss pad could be applied to assist in preventing any leakage. Another plan is to open the abdomen by simply separating the muscle fibres as in the operation of Appendicectomy by McBurney's method (see below).

(6) *Contraction of the orifice.*—It sometimes happens that the orifice becomes so contracted that a constant fæcal dribbling goes on, from the fact of the bowel dilating above into a sac-like receptacle and never, therefore, being properly emptied. The fault lies in the original opening being too small and the union of the surrounding edges taking place by granulation instead of by first intention. When undue

contraction begins to show itself, the anus should be dilated daily by some form of dilator; and if this is not sufficient the orifice must be incised to the required extent.

Lumbar anus.—The first part of the operation resembles that for lumbar colostomy. After identifying the bowel, a knuckle is brought outside the wound and left *in situ*. No stitches, according to Bryant, are necessary, the bowel needs only to be protected. On the fourth or fifth day the bowel is punctured with a tenotomy knife, and the opening enlarged for about half an inch in length.

There is no need to describe the operations for the formation of an artificial anus in other parts of the intestine. They are carried out on much the same lines as those for the formation of a sigmoid or a lumbar anus.

Closure of fæcal fistula and artificial anus.—After the operations of colostomy and others of a similar nature in other parts of the intestine, it occasionally becomes necessary to close the fistula, and to do so an operation is requisite.

In the simplest cases, where, for instance, no obstruction any longer exists below the artificial orifice, and where the fistula is only prevented from closing by reason of a projecting process of mucous membrane, all that is necessary is to dissect away the latter and draw together the freshened skin edges.

In cases where the fistula is kept open on account of a projecting "spur" which prevents the free passage of the contents of the bowel above into the segment below, means must be taken to remove it. The existence of a "spur" indicates that a considerable portion of a knuckle of intestine is adherent to the parietes, and that the fistula approaches that of an artificial anus. The operation for the remedy of this condition is divisible into two stages: the first consists in the destruction of the "spur"; and the second in the closure of the orifice in the bowel, and in the parietes. To remove the "spur" various kinds of clamps have been invented. All have the object of causing the "spur" to slough away by the continued pressure of the two blades of the clamp. An enterotome, originally invented by Dupuytren and known by his name, answers the purpose well.

To close the intestinal and the parietal orifices, the following method may be employed:

The anus is first cleansed, and stuffed to a sufficient extent so as to check any possible contamination of the peritoneal cavity by the escape of fæcal material. An incision of sufficient length is made to open the free abdominal cavity above and below the anus, and to embrace the latter within it. After the adhesions are separated and the bowel thus liberated, it is withdrawn through the parietal wound, and either enterectomy is performed, or the orifice is closed and the loop containing the anus "short-circuited."

12. **Appendicectomy.**—The operation consists in the removal of the appendix vermiformis for disease connected with the part.

Operation.—When appendicectomy is performed during the quiescent period in cases of relapsing appendicitis, the same precautions should be taken and the same preparations made as for any other operation upon the gastro-intestinal canal. The bowels should be emptied by aperient medicines, and the use of copious fluid enemata on the morning of the operation. The skin is cleansed in the usual way, and proper attention is devoted to the clothing of the patient and the warmth of the operating-room.

Parietal incision.—The practice which I now always adopt is to make my incision according to the special features indicated by the case. If I can feel an enlarged appendix, or there is a resistance only to be detected, the centre of the various incisions is kept over the centre of the involved area. A five or six inch curvilinear incision is carried through the skin, superficial fascia, and aponeurosis of the external oblique. The margins of this wound are widely retracted. The second incision passes almost at right angles to this, and in the direction more or less, therefore, of the fibres of the internal oblique and transversalis; the margins of this incision are also forcibly retracted while the third incision divides the transversalis fascia, subperitoneal fat, and peritoneum in a direction similar to the first. Retracting the margins of this incision, the large intestine is first sought for, which may involve the separation of many adhesions. The bowel is known by its longitudinal muscular bands, and one of these being traced down will lead to the appendix. As the adhesions are carefully separated the bowel is withdrawn as much as possible through the wound,

and when once a communication is established between the affected area and the general peritoneal cavity, packing of sterilised tissue should be so inserted as to prevent the possibility of any contamination of the abdominal cavity. The surgeon is thus enabled to work away with absolute safety.

This mode of reaching the appendix was originally proposed by McBurney, and is in every sense an admirable one when more room than it affords is not required. It necessitates at least two assistants to retract well the margins of the two different lines of incision. If sufficient room is not afforded it becomes necessary to divide transversely—that is to say, in the same direction as the superficial and deep incision—the internal oblique and transversalis.

When the appendix has been isolated and brought within the sphere of operation, the simplest and most rapid method of its removal consists in first tying and dividing its mesentery, and then passing a ligature tightly around it near its origin from the cæcum, cutting it off and then cleaning well or cauterising the end of the stump. This method may and frequently will do perfectly well. It leaves, however, an element of risk, in the piece of mucous membrance which is necessarily exposed and projects from the orifice of the stump. When the disease of the appendix consists in some inflammatory affection of the mucous lining, this latter is liable to prove an infective focus, and should therefore be securely dealt with. To attain this object several plans have been suggested. One of the simplest is to ligature and remove the appendix close to the cæcum, and then draw together by a few stitches two folds of the neighbouring cæcal peritoneum. The stump is thus buried. By some it is advised to scarify the serous membrane before uniting it over the stump to ensure a more secure closure.

The wound is closed by three lines of sutures corresponding to the three incisions. The first, a series of interrupted silk stitches, takes up the margin of the peritoneum and transversalis fascia; the second, also a series of interrupted silk stitches, takes up the internal oblique and transversalis; and lastly, the skin and external oblique are brought together by a continuous suture. I prefer, however, to introduce a double continuous suture, one for the external

aponeurosis and one for the skin, making in all four separate series of sutures.

The operation as thus described I have performed several times, and where, as is most frequently the case in appendicectomy for recurrent appendicitis in the quiescent period, the wound heals by first intention, the abdominal wall is as sound as it was before operation, and remains so.

The many complications and difficulties which may be encountered in attempts to remove the appendix have already been described (see page 373); and from a reference to these it will be seen what modifications of the above mode of operating may be necessary regarding the size and position of the skin incision, the mode of dealing with the appendix, and the after treatment of the wound.

13. **Other operations.** — There are several other operations in which the bowel plays an important part, but which it is usual to describe under other headings. Thus the operation of gastro-enterostomy has been fully described in the operations upon the stomach. The operation of cholecyst-enterostomy is usually dealt with in works upon diseases of the gall bladder; it consists in forming a fistulous communication between this viscus and the bowel. The operation of uretero-enterostomy consists in a lateral implantation of the ureters into some part of the intestine, usually the rectum or the colon. An operation which is called "cystenterostomy" has been devised for establishing a communication between the posterior wall of an extroverted bladder and the intestine.

PART IV.

THE RECTUM.

THE RECTUM.

CHAPTER LI.

ANATOMY AND PHYSIOLOGY. SURGICAL ANATOMY. METHODS OF EXAMINATION.

Anatomy.—The rectum extends from the left sacro-iliac synchondrosis to the anus. It measures in the adult about eight inches in length, varying somewhat according to the height of the individual. In short women it may not be longer than five inches. It takes a somewhat winding course, passing downwards from the left side above, to the median line, then following the concavity of the sacrum and coccyx, and finally turning sharply backwards round the latter to reach the anus. It is constricted at the anus, and slightly also at its commencement or junction with the sigmoid flexure; between these two points it is dilated. In shape it may be roughly likened to a club, the most dilated portion being below, about an inch within the anus. In some cases there is a tendency to pouching of the bowel forwards immediately prior to its constriction at the sphincters. The rectum is kept in a more or less fixed position by means of the peritoneum and the recto-vesical fascia. The former, by its attachment to the sacrum behind, after surrounding the upper portion of the bowel, constitutes a meso-rectum, while the latter forms a sheath which surrounds and supports the lower segment.

In order to simplify the description of the rectum and its

relations, it is divided into three parts—an *upper*, *middle*, and *lower*.

The *upper* or *first portion* extends from the left sacro-iliac synchondrosis to the middle of the third sacral vertebra. It measures about three and a half inches in length, and is almost entirely surrounded by peritoneum. Posteriorly it is in contact with the pyriformis muscle, the sacral plexus of nerves, and the branches of the internal iliac artery of the left side, which separates it from the sacrum and the sacro-iliac joint. In front is the recto-vesical pouch in the male and Douglas's pouch in the female, both of which contain coils of small intestine.

The *middle* or *second portion* extends from the middle of the third sacral vertebra to the tip of the coccyx. It measures about three inches in length, and is covered by peritoneum on the front and sides above, but only in front below. Posteriorly it lies in the hollow of the sacrum and coccyx, and in front it has the trigone of the bladder, the prostate, and the vesiculæ seminales and vasa deferentia in the male and the vagina in the female.

The *lower* or *third portion* extends from the tip of the coccyx to the anus. It measures about an inch and a half in length. A triangular space intervenes between it and the membranous and bulbous portions of the urethra in the male, and between it and the vagina in the female. The lower inch of this part constitutes the anal portion of the rectum.

Structure.—The structure of the rectum resembles in many points that of the colon; it differs, however, in the distribution and arrangement of its coats. Thus the external or *serous* coat, formed by the peritoneum, only constitutes a tunic of the upper half of the rectum. It surrounds the upper portion, forms the front of the second part, and only exists on the upper part of the sides of the latter; the third part has no serous coat. The *muscular coat* is uniformly distributed around the bowel. The external longitudinal fibres are thicker above than below; while the internal are thicker below than above, forming the internal sphincter at the anus. The middle portion of the levator ani muscle is connected with the lower part of the rectum; its fibres are prolonged upon the bowel until

they blend with the external sphincter. Cripps* maintains that the fibres of the levator ani pass from the front and sides backwards to the coccyx, and so encircle the bowel as to have a sphincter-like action upon it.

The *mucous membrane* is thicker, redder, and more vascular than that lining the colon. Like it, however, it is covered with the same columnar-shaped epithelial cells. The mucous membrane rests upon a comparatively lax submucous tissue, which admits of considerable freedom of movement upon the muscular coat. When in a contracted condition the mucous membrane is thrown into numerous longitudinal folds, which disappear on distension of the bowel. Other folds, transverse or oblique in direction, are more or less permanent. Three of these, larger than the rest, are known as Houston's folds. They are somewhat oblique in direction, and are half an inch or more in depth. "One of these projects backwards from the upper and fore part of the rectum opposite the prostate gland; another is placed higher up, at the side of the bowel; and a third still higher."

The mucous membrane contains numerous crypts of Lieberkühn; and deeper than these glands are scattered rounded lymphoid follicles resembling the solitary glands of the small intestine.

Vessels and nerves of the rectum.—The arteries which supply the rectum come from three different sources. Those to the upper part come from the inferior mesenteric, and are known as the *superior hæmorrhoidal;* those to the middle portion are the *middle hæmorrhoidal*, branches of the internal iliac; and those to the lowest segment the *inferior hæmorrhoidal*, branches of the pudic artery. In the upper half of the rectum the arteries perforate the muscular coat and form a network in the submucous tissue. In the lower half the vessels, after penetrating the muscular coat, take a longitudinal course towards the anus, where they finally join by numerous transverse branches.

The *veins* follow the distribution of the arteries. Commencing as a plexus at the lowest part of the bowel they pass upwards, and end by joining branches which terminate in the internal iliac vein and in the inferior mesenteric

* *Diseases of the Rectum and Anus*, 1884, p. 8.

vein. Blood is thus returned to the vena cava, either directly through the iliac veins or indirectly through the portal system.

The *lymphatic vessels* are of large size. They pass from the bowel through small glands which lie on its outer wall, and then upwards by the meso-rectum to the sacral and lumbar glands.

The *nerves* are derived mostly from the pelvic plexuses of the sympathetic, which are derivatives of the hypogastric plexus situated in front of the upper part of the sacrum. Some branches also pass from the sacral plexus of the cerebro-spinal system.

Physiology.—The rectum when at rest is usually empty, and the mucous walls in contact. The descent of fæces into the canal usually induces the act of defecation. The rectum can, however, act as a temporary receptacle for the fæces until their voluntary ejection. Normal defecation consists in the continuance of a peristaltic wave which commences in the intestine above and continues downwards until the relaxed sphincters admit of the escape of the fæces. Too violent ejection is supposed to be somewhat checked by Houston's valves, which retard the downward progress of the fæces. These valves also serve to support the contents and prevent undue pressure upon the sphincters.

The action of the levator ani is considered by some to be of the nature of a sphincter: by others to give support to the lower part, and by contracting to draw it up and invert its anal border after defecation.

The mucous membrane secretes mucus for the lubrication of the fæces to facilitate their passage through the anus.

Free absorption of fluids takes place; and, as shown by the successful employment of enemata, the bowel also absorbs certain solid ingredients when administered in a suitable form.

Surgical anatomy.—When the finger is inserted into the rectum the involuntary contraction of the sphincters is felt for about an inch up the bowel. If the patient is made to voluntarily draw up the bowel, "the upper margin of the contracted portion ends abruptly and gives a sensation of a broad muscular band round the bowel." This Cripps attributes to the voluntary contraction of the levator ani muscle.

With the finger thus inserted the shape and capacity of the bowel can be recognised. If the rectum be first partially distended with water a better notion is obtained of its size.

While the finger cannot, in the majority of adult cases, reach much beyond three to four inches, this will as a rule embrace that part of the bowel which is uncovered by peritoneum. Downward pressure on the part of the patient increases the length which can be examined. The depth to which the recto-vesical peritoneal pouch may descend depends upon the empty or distended condition of the bladder. According to Cripps the distance from the anus to the peritoneum is only two and a half inches when the bladder and rectum are empty; but when distended an additional inch is added.

In the male the finger within the rectum detects on the anterior surface, about an inch and a half to two inches from the anus, the prostate gland. In front of this exists the membranous part of the urethra which is recognised on the passage of a catheter. Posterior to the prostate is felt the apex of the trigone of the bladder, with the ejaculatory ducts, and the vesiculæ seminales on each side. In children the bladder in its entirety can be easily palpated bimanually. The finger can also detect the pulsation of the hæmorrhoidal arteries, and distinguish one or more of Houston's folds. Laterally there is felt the soft unresistant tissues of the ischio-rectal fossæ.

In the rectum of the female the os uteri is distinctly felt on the anterior wall; and anterior to this is the thin septum between the rectum and the vagina.

The upper portion of the rectum, and the parts in relation to it, can only be detected by the introduction of the hand. In addition to the facts ascertainable by the finger and given above the following points are elicited: "Through the posterior wall of the bowel the coccyx and sacrum can be felt, the curve of the sacrum being readily followed by the hand. The projecting spine of the ischium on each side of the pelvis is a valuable landmark. From this point the outlines of the greater and lesser sacro-ischiatic foramina can be traced by the fingers. . . . If the hand be now pushed farther up the gut, the promontory of the sacrum is reached; the pulsation of the

iliac vessels becomes manifest, and the course of the external iliac can be traced along the brim of the pelvis to the crural arch. . . . The internal iliac artery can also be followed to the upper part of the great sacro-ischiatic foramen. By semi-rotatory movement, and alternately flexing and extending the fingers, the hand can gradually be insinuated into the commencement of the sigmoid flexure. In the sigmoid flexure the fingers can explore the whole of the lower part of the abdomen. . . . In the female the uterus in the middle line and the ovaries on either side can be readily distinguished."* (Walsham.)

In introducing the hand into the rectum, two fingers should be inserted first, then the other two, and lastly the thumb. The passage of the hand is facilitated by freely lubricating it with vaseline, and by the application of the other hand upon the abdomen. Progress should be effected by a careful rotatory motion of the hand. As regards the size of the hand which it is possible to introduce without causing immediate danger or subsequent incontinence of fæces, it naturally follows that the smaller the hand the less must be the untoward consequences. Walsham's hand measured somewhat less than seven and a half inches. Bryant also succeeded with his hand, which measures nine and a quarter inches.

Method of performing rectal examination.—Prior to any examination of the rectum it is advantageous, when possible, to administer a water enema. One of three positions is usually adopted for examination. The patient is either placed on the side, or on the back, or on the knees and chest. In the lateral position the patient lies on a couch or table of ordinary height, preferably on the left side, with the knees flexed and the thighs drawn up. In the dorsal position the knees and thighs are flexed and abducted, the position being the same as that for lithotomy. In both these positions the pelvis should be raised upon a pillow, so that the intestines gravitate away from the pelvis. In the knee-breast posture the patient kneels upon the table with the chest resting upon the arms folded across the table.

The index finger of the right hand is lubricated with vaseline. By slow and gradual insertion the contraction of

* *St. Bartholomew's Hospital Reports*, 1876, vol. xii.

the sphincter is overcome, and the finger introduced without causing much pain.

When it is desirable to see the parts as well as feel them, one of the many forms of rectal speculum is introduced with the same precautions as the finger. If good natural light cannot be obtained some artificial means must be employed; and for this purpose lamps with reflectors are sometimes used. An excellent method is to reflect a light from an ordinary laryngoscopic mirror fixed on the surgeon's forehead.

Whether the finger or the speculum be used, not only should the lining wall of the gut be carefully examined, but it should be noted whether either on withdrawal is tinged with blood or purulent material.

CHAPTER LII.

INJURIES. FOREIGN BODIES. FÆCAL CONCRETIONS.

The deep and protected position of the rectum within the osseous walls of the pelvis renders it specially exempt from all those forms of injury which are liable to affect the other more exposed parts of the gastro-intestinal canal. The region of the perineum, and the orifice of the rectum itself, naturally form the most vulnerable parts. Hence nearly all injuries are inflicted by the impingement of, or the introduction of bodies into, this region. The only exceptions are gunshot wounds and severe fractures of the pelvis.

Injuries which result from some impingement are among the commonest and most severe of wounds of this region. A fall upon some more or less hard and pointed body results in the latter entering the perineum and cutting or lacerating the walls of the bowel and the tissues surrounding it. Injuries of this nature are accidental. On the other hand, injuries of various degrees of magnitude have been produced by the voluntary introduction of agents of various kinds through the anus. In some instances bodies have been introduced with the object of temporary

concealment; while in others they have been employed for special purposes. Among the latter it is interesting to note that severe injury has been inflicted by surgeons in making use of the rectum for operative purposes elsewhere. Thus rupture of the rectum with fatal result has followed its distension by Petersen's bag in performing suprapubic cystotomy. Another source of injury has been in the use of Davy's lever from compression of the common iliac artery in amputation at the hip joint; and a similar source is found in the forcible introduction of solid bougies for stricture, which have been made to perforate the upper part of the bowel wall and cause death by peritonitis. Such a simple procedure as the introduction of enemata has been followed by serious results, due directly to the careless employment of injecting apparatus.

The rectum has also been injured by the surgeon in cutting for stone in perineal lithotomy, both in the median and the lateral operation.

Injuries usually of a slighter nature are effected by foreign bodies passing into the bowel from above. These, however, will be alluded to later.

Ruptures, lacerations, and contusions of the anterior wall are produced during parturition. Injuries of this character are usually more fully described in works on Gynæcology.

Nature of injury inflicted.—The agent inflicting the injury chiefly determines the kind of lesion produced. It may be of the nature of a contused, incised, punctured, or lacerated wound. The higher the seat of the injury the more likelihood is there of the peritoneal cavity being involved. The extreme vascularity of the bowel, and the want of any firm support to the vessels, renders considerable hæmorrhage possible.

Results of injury.—Injuries which involve a part, and not the entire bowel wall, usually heal well. When, however, the whole thickness of the wall is involved, complications are liable to be present, or subsequently arise from injuries inflicted upon neighbouring parts. Complete perforation, rupture, or laceration occurring in the upper half of the rectum may open the general peritoneal cavity; while like lesions occurring lower down may open the bladder or urethra in the male, or the vagina in the female.

Inflammation arising as the result of injury may be limited to the bowel wall, causing either a localised or a general proctitis. This may end in ulceration or sloughing, especially if there has been laceration of the parts, and this, too, may end at a later period in the formation of stricture.

When inflammation has extended into the perirectal tissue, abscess may form, and if it does not discharge into the bowel, it may burrow and open externally. Abscesses which burst into the bladder may result in recto-vesical fistulæ.

Symptoms.—The severity and nature of the injury will mostly determine the character of the symptoms. Bleeding may prove a prominent feature where much laceration of the bowel wall has taken place, but neither its presence nor its absence must be counted upon as any true criterion of the nature of the wound. Pain may be felt both in the region itself, and reflexly in other parts, as above the pubes, and in the perineum. Any "movement" of the bowels will cause pain. These various symptoms become augmented if inflammation sets in; fever and other constitutional disturbances are then added.

Treatment.—The only immediate treatment that is likely to be required will be to check any undue hæmorrhage. The anus should be forcibly dilated, and any bleeding points secured by ligature; failing such means, compression should be exercised by the insertion of a tube or catheter wound round with some antiseptic tissue to the required diameter. Any complication existing at the time, or arising subsequently, must be dealt with on general surgical lines.

Foreign bodies. Fæcal concretions.—By foreign bodies in the rectum is understood only such as become impacted and give rise to symptoms. The class is a large one, because it embraces two sources from which these substances may be derived. Either they descend into the rectum from above, or they are introduced into it through the anus.

With regard to the former source, the "bodies" consist either of materials ingested or of those formed within the intestinal canal, mostly, however, of the former. These may be articles of ordinary diet, such as fish bones, chicken

bones, and parts of foods which fail to be digested in their passage through the stomach and intestines; or they may consist of such foreign materials as nails, pieces of cloth, &c. An interesting account of twenty cases of foreign bodies impacted in the rectum is given by Goodsall;* the materials consisted in almost all instances of bones, mostly from fish. Some of the inferences drawn from these cases are,—that the accident is more commonly met with after thirty-five years of age: that a bone takes from one to nine days to pass from the mouth to the rectum: that the pain comes on suddenly while the motion is being passed: that there is constant pain or discomfort in the rectum and sometimes also in the subjacent parts, from the time of the puncture until the foreign body has been removed; and that the site of the puncture is within the last inch or three-quarters of an inch of the anus.

When derived from the latter source, there is no limit to the extraordinary number and nature of the articles which patients from most varied motives may introduce into the rectum.

The *impaction of fæces* within the rectum owes its origin to various causes. In some cases a want of tone in the muscular wall of the bowel allows of a gradual distension of the part. As a result of prolonged retention, and the consequent absorption of all fluid constituents, the fæcal mass assumes a more solid and compact consistency until it forms a hard mass which no voluntary effort on the part of the patient can expel. In other cases a concretion, which may possibly have a fish bone or other like substance as a nucleus, forms in the bowel above, and then descending into the rectum, gets lodged in a mucous fold or pouch, where, by fæcal accretion, it enlarges, and finally becomes too large for expulsion.

Symptoms.—Considerable variation necessarily exists in the symptoms which may be present in any case of impacted foreign body, for the patient's sufferings must largely depend upon the character of the body impacted and the injury inflicted upon the bowel wall. Further, the completeness with which the canal is blocked will influence very naturally the amount of constitutional disturbance.

* *St. Bartholomew's Hospital Reports*, 1887, vol. xxiii. p. 71.

In its simplest effects a foreign body may cause no further distress than an ill-defined sense of discomfort, from which the patient only gets relief by a complete evacuation of the bowels. In cases, however, where the impaction means some perforation of, or undue pressure upon, the bowel wall, pain becomes a prominent and often an excruciating symptom, felt in the region itself, and often in the abdomen, and in the perineum.

The patient frequently becomes greatly distressed at his own ineffectual efforts at extraction or expulsion, and con stant straining and tenesmus leads to a patulous and swollen condition of the mucous membrane at the anus. Frequency of micturition may exist either from undue pressure upon the bladder or from reflex nerve irritation. Pressure on the sacral plexus posteriorly may cause pain to radiate down the lower extremities. Blood, in variable quantity, is occasionally discharged from the anus, and as time progresses this may be mixed with mucus or pus, indicating the appearance of inflammation and ulceration. Constipation is a common symptom in most cases; but while no solid motion is passed, it is frequent for some offensive slimy material to be expelled, as the result of constant efforts to get relief.

Diagnosis.—Much difficulty frequently exists in attributing the symptoms to their true cause, and in detecting the presence of a foreign body when suspected. Most difficulty in diagnosis is encountered in those cases where the foreign body has descended from above into the rectum. Whether the obstruction be complete or only partial, it is often only by careful digital examination that the source of the trouble is found. Should perchance the "body" or "bodies" be impacted at the upper part of the rectum, the real source of obstruction may not be detected until after the abdomen has been opened. "Bodies" introduced *per anum* do not as a rule pass out of reach of the finger; exceptions, however, occasionally occur. In this latter class, assistance is often obtained from the confession of the patient, the severity of whose symptoms may no longer permit him to conceal the true cause of his sufferings. The best indication of the existence of an impacted foreign body is the sense conveyed to the patient of something within the rectum which constant calls to stool fail to relieve.

Prognosis.—If the foreign body has remained only a short time impacted, and the immediate injury to the bowel is only slight, removal should be followed by complete and permanent relief. If on the other hand the impaction is prolonged, many complications may arise, dependent upon the nature of the agent and its effect upon the bowel wall. Thus inflammation, ulceration, or sloughing may occur, with possibly later perforation. Should these processes take place in the upper part of the rectum, the peritoneum may become involved, and then either a local peritonitis set up, with possibly abscess formation; or a more general peritonitis may arise and prove fatal.

When ulceration takes place nearer the anal extremity of the gut, a perirectal abscess may form, and bursting externally somewhere in the perineum, give rise to one of the forms of fistula in ano. Fistulous communications may also be formed with the bladder or urethra in the male, and with the uterus or vagina in the female.

In cases of less extensive injury to the bowel wall, such for instance as more frequently occurs when fæces are impacted or the foreign bodies pass into the bowel from above, the mucous membrane becomes inflamed from the constant irritation to which it is subjected. In some cases this irritation leads to nothing more than a slight catarrhal inflammation; in others, however, its severity causes the condition to be almost dysenteric in character.

When the rectum is completely blocked by the impacted mass, so that flatus cannot pass, symptoms of acute intestinal obstruction set in, less in severity as a rule than in cases of obstruction higher up the bowel.

Treatment.—In almost all cases of foreign bodies in the rectum, whether introduced from below through the anus or descended from above, mechanical measures alone are of service in effecting removal. When within reach of the finger, a careful examination should be first made to ascertain the nature and situation of the obstructing agent. If it be found too large to be easily withdrawn, the anus should be dilated, so as to avoid any undue laceration of the parts. Should difficulty still exist, a free incision may be carried through the sphincter backward towards the coccyx. By traction and rotatory movements, exercised either with the fingers or with forceps, most obstacles can be removed.

In cases where the "body" has been forced up beyond the reach of the finger, much difficulty may be encountered in attempting its withdrawal. If extraction cannot be effected by a long pair of forceps, the surgeon is forced to the ultimate resource of sigmoidotomy.

When the rectum is obstructed by hard fæces, or foreign bodies which have passed into it from above, the finger is frequently capable of breaking down the mass and dislodging it by fragments. Failing the finger, a scoop or spoon will usually prove successful.

If there is reason to fear that the rectum has already suffered injury, either from the prolonged retention of the foreign body or from the special nature of the impactin agent, or perchance during the process of removal, every care must be taken to give the parts rest. The patient should be confined to bed, mild aperients administered to keep the motions soft, and in some cases the bowel washed out with warm water. All complications must be treated on general surgical principles.

CHAPTER LIII.

DISEASE. INFLAMMATION: PROCTITIS, PERIPROCTITIS. NON-MALIGNANT ULCERATION.

In discussing diseases of the rectum, it is only intended to deal with such as involve the strictly intestinal portion of the canal. Hence such affections as hæmorrhoids, fistula in ano, fissure, and anal ulcer, which implicate the anus and an inch or so of the bowel above it, do not come within the scope of the present work.

The diseases to be considered are inflammation, ulceration, non-malignant stricture, carcinoma and sarcoma, innocent tumours, prolapse, neuroses, malformations, and conditions dependent upon external influences.

Inflammation.—Involvement of the bowel wall alone constitutes proctitis, while implication of the tissues around it is termed periproctitis

Proctitis.—The inflammatory action may be acute or chronic, local or general. In the acute form the mildest manifestation is that of a simple catarrh of the mucous membrane, while its severest type is met with in some of the more virulent cases of dysentery. The disease may arise from some local irritation or from infection. In the former case it may be the result of injury, of foreign bodies, intestinal worms, fæcal accumulation, or it may be due to the administration of drastic purgatives either by the mouth or by injection. Not infrequently some inflammation exists in cases of stricture, whether simple or malignant, and in polypus.

Inflammation the result of infection arises from gonorrhœa, diphtheria, and erysipelas. In these cases the virus is usually carried to the part either by extension from the vagina in the case of the female, or by direct introduction from without. In the case of gonorrhœa it has been known to follow sodomy.

Dysentery constitutes a disease of itself, and often implicates some portion of the colon as well as the rectum.

Symptoms.—In its mildest form inflammation of the rectum is recognised by a reddened and swollen condition of the mucous membrane, which sometimes protrudes from the anus. Tenesmus is frequently present, and mucus in variable quantity is passed, sometimes alone, at other times mixed with the fæces. The condition of the bowels varies, sometimes being constipated, at other times relaxed. Some degree of pain is usually felt in the rectum, and this may radiate to the back and down the limbs.

The more acute the inflammatory process the more prominent become these symptoms. Instead of mucus in the evacuations, they may contain pus and blood; the pain assumes more of a burning character. Digital examination causes considerable pain, while the finger detects a heated and swollen state of the mucous membrane. In addition to these local symptoms there may be more or less constitutional disturbance. The patient will be feverish, with loss of appetite, loss of sleep, and other disturbances dependent upon these conditions.

The constant discharge of mucus and inflammatory products from the rectum is liable to produce an inflamed, excoriated, and painful condition of the anus and the skin around.

In some cases there is frequency of micturition, due to the reflex irritation of the bladder.

In the severest form of acute proctitis—that due to dysentery—there is more disturbance, both constitutionally and locally, than is usually met with in inflammation arising from other causes. The disease should be studied in works on medicine, where it finds a more fitting place for discussion than in a work on surgery.

Prolonged acute inflammation may lead to grave secondary lesions, such as ulceration, perirectal inflammation, abscess, and peritonitis.

Chronic proctitis may either exist as such from the outset, or it may follow upon an acute attack. The symptoms are much less severe, and consist chiefly in the discharge of mucus with the motions, which as a rule are rather solid than loose, and are passed infrequently. Prolonged inflammation may lead to contraction of the calibre of the canal, and this may finally end in ulceration or stricture.

Treatment.—Attention must be directed in the first place to the cause of the condition. When this is of a removable nature, all symptoms may rapidly subside on its being efficiently dealt with. Should, however, the inflammation continue, both local and general measures must be adopted. The patient should be confined to bed, and placed upon a diet of a bland and simple kind. Mild laxatives should be administered if there is a tendency to constipation. Hot hip-baths may relieve the pain and also lessen the congestion. If local applications are considered requisite, water as warm as can be borne should be injected, and the addition of a few drops of laudanum will assist in producing a soothing effect. In chronic cases astringents such as alum and tannin should be injected.

The treatment of dysentery hardly calls for any remarks by the surgeon, and would not be mentioned here were it not for the fact that it, like chronic membranous or ulcerative colitis, has in recent years yielded to the surgeon's operative measures where the physician's therapeutic efforts have failed. At a meeting of the Clinical Society of London in December 1895, Godlee * mentioned a case of dysentery in which much improvement had followed upon opening the

* *Brit. Med. Journ.* 1895, vol. ii. p. 1559.

colon. The rationale of such treatment exists in the complete rest afforded the inflamed and ulcerated mucous membrane by the temporary diversion of the fæces through an artificial anus.

Periproctitis.—Inflammation of the tissues around the rectum occasionally arises as an extension from inflammation of the rectum itself; as often, however, it owes its origin to some cause situated without the rectum. It may be local or general—in other words, it may consist in the formation of a circumscribed abscess, or in an acute cellulitis involving a considerable extent of the perirectal tissue.

The localised or circumscribed form of periproctitis frequently owes its origin to the extension of a perforative ulceration. This ulceration may result from injury, direct or as the result of a foreign body, from stricture, or from any of those causes which will be found more fully described under the heading of Ulceration. The situation of the inflammatory focus is important as bearing upon the possible complications which may arise. Thus, when located below the levator ani, the abscess may burst in one or more places on the perineal surface; and should a communication also be formed with the rectum, one form of fistula in ano would result. On the other hand, with an abscess arising above the levator ani, a rupture might take place into the bladder or the peritoneal cavity.

A form of periproctitis, described as gangrenous, is occasionally met with in men addicted to good living and free drinking. The inflammation is of a severe type, and involves considerable necrosis of cellular tissue around the lower part of the rectum. Both ischio-rectal fossæ are infiltrated with inflammatory products; the skin around the anus becomes reddened and almost livid in appearance; there is much pain, and the patient usually suffers from fever and other constitutional disturbances. The treatment consists in free and deep incisions into the ischio-rectal fossæ.

In other cases of localised or general periproctitis, efforts should be made to prevent the advance of the inflammation to suppuration by the injection of hot water and the administration of laxatives. When it is to be feared that suppuration is commencing, the bowel wall should be incised, and relief thus afforded to the congested and

inflamed area. The value of forcible dilatation of the anus should be remembered when free drainage is required.

Non-malignant ulceration.—Non-malignant ulceration is much more frequently met with in women than in men. In the majority of instances it is the sequel to inflammation, and may therefore be met with in the later stage of all those inflammatory affections which have just been described. These causes, briefly recapitulated, are injury, either direct or from the presence of foreign bodies, fæcal retention or impaction, drastic purgatives, chronic diarrhœa in children, polypus, stricture, dysentery, gonorrhœa, and diphtheria. In addition to these must be added ulcers resulting from tuberculosis, syphilis, varicose veins, and from special causes arising without the bowel, such as those connected with parturition and vaginal affections.

While it is possible to enumerate the various probable causes of ulceration, it is by no means so easy to ascribe to any particular lesion its true cause. In cases where there is a definite history of injury, disease, or previous inflammation of some recognised kind, little difficulty exists in determining the cause; but these cases may be said to constitute the minority. In the large proportion of cases no definite predisposing or exciting cause is ascertainable; and the somewhat unreasonable custom in the past has been to ascribe these otherwise inexplicable ulcers to syphilis. The tendency, however, of modern surgeons is to find other explanations of their existence, and not to relegate to syphilitic action that which cannot be ascribed to anything else, and which has not, in many cases, even the evidence or history of the constitutional disease to support it.

Ulceration of the rectum presents features very much the same, no matter what the cause. It may be so slight that it consists of little more than a superficial erosion of the mucous membrane. While on the other hand it may extend so deeply as to cause perforation of the bowel wall and establish communications with the tissues and parts around. Again, the ulcers may be single or multiple, and vary in size from a small point, as in the follicular ulcer of infantile diarrhœa, to involvement of almost the entire bowel wall, as is sometimes seen in dysentery and in slowly progressive chronic ulceration. The character of the ulcer also varies according to its acuteness or chronicity, such variations

being indicated by the amount of induration or vascularity of its base and edges. The tendency which most ulcers of the rectum have to spread and coalesce naturally gives rise to considerable variation, dependent upon the stage at which the process has arrived, or, in other words, the time during which it has been going on.

Among the ulcerative processes which call for a more detailed description are the dysenteric, the tubercular, the syphilitic, the varicose, and those dependent upon special causes, such as parturition and vaginal inflammation.

Dysenteric ulceration.—As most frequently met with in mild cases, the initial inflammatory process gives rise to follicular ulceration, so that the bowel surface presents numerous small ulcers, at first superficial and discrete, but later becoming deeper and confluent. In the severest types of the disease, large ulcers result from the necrosis of patches of mucous membrane, due to the detachment of the part by extravasated blood. Such extensive and deep ulceration leads sometimes to perforation, with all the consequences dependent upon abscess formation and fistula. As a feature somewhat distinctive of this kind of ulceration in its acute stage, the mucous membrane around the centres of necrosis is frequently acutely inflamed and much swollen.

As the disease subsides, the acute inflammatory process also diminishes, and the rectum then presents the more typical characters of limited and uncomplicated ulceration. It is in this condition that the disease is most frequently presented to the surgeon; and which, in the process of healing, may give rise to one of the forms of non-malignant stricture.

Tubercular ulceration.—The process by which the rectum becomes involved in tubercular disease differs in no respect from that which occurs in other parts of the intestinal canal. As in these also, the disease is usually a concomitant of disease elsewhere, most frequently of pulmonary phthisis.

The process commences by the deposition of tubercle in and beneath the mucous membrane; these deposits caseate and break down, and when several are in close apposition, the result is an irregular destruction of tissue, with the formation of an ulcer.

The ulcers follow the usual type of tubercular ulceration

elsewhere; the edges are frequently thin and undermined; the surface is more or less smooth and glazed in appearance; the outline is irregular, and the tendency of the ulcer is to extend both superficially and deeply. If the bowel wall is perforated, abscess may result; and this bursting into some other part may lead to complications similar to those already alluded to as liable to result from all perforative processes of ulceration.

In and around the ulcer, nodules are often seen. These are deposits of tubercle, and constitute one of the typical features of the ulceration.

The usual course of the disease is to progress; when, however, healing takes place, stricture may follow as the result of the repair.

Syphilitic ulceration.—The frequency with which syphilitic ulceration occurs is probably much less than was at one time supposed. The tendency to ascribe all ulceration to syphilis, which could not be accounted for in any other way, is as unreasonable as it is erroneous. The certain absence of any specific history should in the majority of instances as certainly exclude syphilis in the *rôle* of causes as the absence of a history of dysentery would be considered sufficient to exclude that disease. And the additional fact that any ulcer is not affected by antisyphilitic treatment should render even the suspicion of a specific taint untenable.

That ulceration may result from syphilis is another question, and one which most surgeons would answer in the affirmative. It invariably arises from the breaking down of gummata deposited in the submucous tissue. It occurs as a late and tertiary lesion of the disease. The breaking down of a gumma gives rise to a circular ulcer with sharply defined margins and a vascular base. When two or more deposits coalesce, the ulcer becomes irregular in outline and uneven on its surface. As in the tubercular form of ulceration, the destruction of tissue may extend deeply and give rise to the same train of complications. Cicatrisation of an extensive ulcer may lead to one of the forms of rectal stenosis. (See Syphilitic Stricture.)

Another way in which the rectum may be affected by ulceration is from the extension of specific sores and ulcers which originate around the anus.

Varicose ulcer.—It is reasonable to suppose, and there

is evidence to show, that simple ulcer may form in the rectum as the result of a congested condition of the mucous membrane from varicose veins, just as the same kind of lesion arises from varicose veins in the leg. The only exciting cause necessary to start the process is some slight abrasion; and this is readily enough found in hardened and retained fæces. Most frequently they are situated posteriorly and from one or two inches from the anus. The muscular coat is seldom penetrated. The diagnostic features of this kind of ulcer are: (1) The lack of any tangible or definite cause; (2) its occurrence in otherwise healthy persons; (3) its extreme chronicity; (4) its amenability to proper treatment; and (5) the frequently marked evidence of hæmorrhoids. The special treatment advised, besides that usually adopted in all cases of rectal ulceration, is to make a longitudinal incision through the base of the ulcer, deep enough to sever the circular muscular fibres underlying. This cut is to be continued through the anus with the object of securing drainage and preventing inflammation in the tissues around.

Ulceration from other causes.—There are two other causes of ulceration in the rectum, which serve, to some extent, to explain the greater frequency of the condition in women. One occurs as the result of parturition, and the other from inflammation of Bartholin's glands. In the former case the ulceration results from the destruction of tissue in the upper part of the rectum, caused by being unduly pressed upon, or perchance lacerated in the passage of the fœtal head through the pelvic cavity.

Ulceration secondary to inflammation of Bartholin's glands is a theory propounded by Poelchen, and has been carefully worked out by him. The theory is that inflammation and suppuration of these glands lead to perforation of the rectum and ulceration, the immediate result being the formation of a recto-vaginal fistula. In this way, he believes, is to be explained the large proportion of recto-vaginal fistulæ met with.

Symptoms.—So graphically does William Allingham describe the symptoms of rectal ulceration, that I venture to give a complete abstract from his work on "Diseases of the Rectum."*

* 4th edit. p. 226.

"In the majority of these cases the earliest symptom is morning diarrhœa, and that of a peculiar character; in my opinion it is quite indicative of the disease, and can be confounded only with similar symptoms due to cancer. The patient will tell you that the instant he gets out of bed he feels a most urgent desire to go to stool; he does so, but the result is not satisfactory. What he passes is generally wind, a little loose motion, and some discharge resembling 'coffee grounds' both in colour and consistency; occasionally the discharge is like the white of an egg; or a 'jelly fish'; more rarely there is matter. The patient in all probability has tenesmus and does not feel relieved; there is a burning, somewhat uncomfortable sensation, but not actual pain; before he is dressed he very likely has again to seek the closet; this time he passes more motion, often lumpy and occasionally smeared with blood. It may also often happen that after breakfast, hot tea or coffee having been taken, the bowel will again act; after this he feels all right, and goes about his business for the rest of the day, only perhaps being occasionally reminded by a disagreeable sensation that he has something wrong with his bowel. Not by any means always, but at times, the morning diarrhœa is attended with griping pain across the lower part of the abdomen, and great flatulent distension. When a medical man is consulted the case is, in all probability, and quite excusably, considered one of diarrhœa of a dysenteric character and treated with some stomachic and opiate mixture, which affords temporary relief. After this condition has lasted for some months, the length of this period of comparative quiescence being influenced by the seat of the ulceration and the rapidity of its extension, the patient begins to have more burning pain after an evacuation, there is also greater straining, and an increase in the quantity of discharge from the bowel; there is now not so much jelly-like matter, but more pus—more of the coffee-ground discharge and blood. The pain suffered is not very acute, but very wearying; described as like a dull toothache, and it is induced by much standing about and walking. At this stage of the complaint the diarrhœa comes on in the evening as well as the morning, and the patient's health begins to give way, only triflingly so, perhaps, but he is dyspeptic, loses his appetite, and has pain in the rectum

during the night, which disturbs his rest; he also has wandering and apparently anomalous pains in the back hips, down the leg, and sometimes in the penis. There is yet another symptom present in the later stages, marking the existence of some slight contraction of the bowel, viz. alternating attacks of diarrhœa and constipation, and during the attacks of diarrhœa the patient passes a very large quantity of fæces. These seizures are attended with severe colicky pains in the abdomen, faintness, and not infrequently sickness.

"On examining these cases of ulceration, various conditions may be noticed according to the stage to which the disease has advanced. In the earlier period you may often feel an ulcer situated dorsally about an inch and a half from the anus, oval in form, perhaps an inch long by half an inch wide, surrounded by a raised and sometimes hard edge; there is acute pain caused on touching it, and it may be readily made to bleed. With a speculum you can distinctly see the ulcer, the edges well marked, the base greyish or very red and inflamed-looking, the surrounding mucous membrane being probably healthy; in the neighbourhood of the ulcer may often be felt some lumps, which are either gummata or enlarged rectal glands. This is the stage in which the disease is often curable. . . . Later in the progress of the malady you will observe deep ulcers with great thickening of the mucous membrane, often also roughening to a considerable extent, as though the mucous membrane had been stripped off. At this stage you generally notice, outside the anus, swollen and tender flaps of skin, shiny, and covered with an ichorous discharge; these flaps are commonly club-shaped, are met with also in malignant disease; but in the early development of the disease *no ulceration is found near the anus nor at the aperture*. . . . So definite is this external appearance in long-standing disease, that one glance is sufficient to enable an expert to predicate the existence of either cancer or severe ulceration; these external enlargements are the result of the ulceration going on in the bowel, and the irritation caused by almost constant discharge."

The imperceptible way in which severe ulceration may pass on to stricture produces a train of symptoms which gradually point more prominently to the existence of the

latter than to that of the former. It must further be remembered that, as ulceration proceeds, symptoms may appear, due not directly to the ulcer nor to the resulting stricture, but to other complications, to which either has given origin.

Treatment.—In most cases both local and constitutional treatment is required. As regards constitutional, this has reference more particularly to tubercular and syphilitic ulceration, and the special remedies and measures usually employed in these diseases must be used.

As regards the treatment of the ulcer, the patient should be kept as much as possible in the recumbent position, with the bed or couch raised at the foot, so as to relieve the congestion of the bowel.

Where there is a tendency to constipation, laxatives should be administered.

When it is necessary to deal directly with the ulcer, either stimulants, astringents, or sedative applications may be required.

When the ulcer, from its chronicity or sluggishness, needs stimulating, hot water may be injected; or pure carbolic acid can be applied. In using the latter, care must be taken to guard the skin and mucous membrane around. The insufflation of iodoform is also strongly recommended by some.

To produce an astringent effect, a solution of nitrate of silver, two grains to the ounce or stronger, may be applied. When much pain exists, either opium or cocaine may be used.

Operative measures.—The simplest operation is that of scraping or scarifying. In some instances of tubercular ulceration scraping is considered advisable; as a rule, however, this kind of ulcer increases or diminishes according to the general state of the patient. If the phthisical condition, which is usually present, improves, the ulcer does so also, and *vice versa*, and to scrape under these circumstances may not better matters Scarification is best employed when the ulcer presents indurated edges and shows an indisposition to heal.

In cases of inflamed and irritable ulceration, great relief is afforded by division of the external sphincter, the ulcer gains greater rest and freedom from irritation.

Severer operative measures consist in excising the ulcer or a part of the rectum, or in making a temporary artificial anus in the sigmoid flexure.

CHAPTER LIV.

NON-MALIGNANT OR CICATRICIAL STRICTURE.

No disease of the rectum offers greater difficulties on certain etiological and pathological points than non-malignant stricture. That stricture may result either from cicatrisation of an ulcer, or from inflammation of the rectal walls, or from inflammation arising primarily outside the bowel, is sufficiently certain ; but the difficulty arises when the question becomes one of determining in any particular and doubtful case which of these processes has led to the contraction. Before discussing these points more fully, there are other features worthy of notice regarding the age and sex of the patients usually affected.

By far the larger proportion of cases occurs in women between the ages of 20 and 40. It has, however, been met with at the extreme ages of 80 and 13.

The kind of stricture varies. In the larger proportion of cases the stenosed part is either annular or tubular—that is to say, the canal is obstructed either by a ring-shaped constriction, or it is more or less uniformly narrowed for some distance. In cases of cicatricial stricture following ulceration, the nature of the stenosis necessarily depends upon the shape and extent, both superficially and deeply, of the tissue destroyed. Strictures so formed may exist in the shape of a diaphragm, or as bands crossing in various directions.

Stricture as a sequel to ulceration owes its origin indirectly to the various causes which give rise to the latter. These have been discussed already, and need only be briefly enumerated here. They are traumatism, which may be taken to include direct injuries, impaction of foreign bodies or hardened fæces, operations by the surgeon, and injury

occurring during parturition; syphilis, tuberculosis, dysentery, and varicose veins. While these causes are all enumerated, it must not be understood that they imply in any sense a uniform frequency of occurrence. Rather should they be looked upon as possible causes among which syphilis, tuberculosis, and dysentery probably account for the larger proportion.

When the stricture partakes of the tubular character, its origin may be the result of cicatrisation after ulceration, but it seems more probable that it is a sequal to acute or chronic proctitis. The walls of the bowel, especially the submucous and muscular coats, become infiltrated with inflammatory material, which in organising and contracting produces a rigid and resisting fibrous canal. It is the etiology of this particular kind of stricture which has been the subject of so much controversy in past years. The old custom of ascribing it to syphilis, whether there existed other evidences of the disease or not, has frequently been called in question. Not only is the stricture met with in cases where there is not the least evidence of, or any reason to suspect, syphilis, but the lesion itself has no similarity to specific affections in any other part of the body. That syphilis, however, plays some important part in the formation of certain rectal strictures is acknowledged and sufficiently attested by all statistics.

Among external causes which give rise to stricture the injury resulting from parturition occupies a prominent place. Its influence in producing injury, sometimes of an extensive and serious kind, has been mentioned already.

Pathological sequences.—The results accruing from stricture of the rectum are much the same as those occurring in stricture in other parts of the intestinal canal, modified only by the anatomical relations of the region. One of the earliest changes to take place as the canal narrows is the dilatation of the canal above the obstruction. This is accompanied also with some hypertrophy of the muscular coat and thickening of the mucous membrane. As the dilatation advances its presence may become manifest by a generally distended condition of the abdomen. The irritation to which the mucous membrane above the stricture is exposed by the retained fæces leads to a variable amount of inflammation and ulceration. This process may extend

to the peritoneum and cause a chronic form of localised peritonitis; or, if ulceration advances, abscess in the surrounding tissues may form and burst either into the rectum below the stricture, or find its way into the ischio-rectal fossa, where, by opening externally, it gives rise to one form of fistula in ano. Communication may also be established between the vagina, uterus, bladder, or urethra from the ulceration advancing, or the abscess bursting, into these parts.

Below the stricture changes in the bowel wall are also met with. It is frequently noted that the cavity of the bowel is unusually large, this condition being technically described as "ballooning." The mucous membrane is often ulcerated and the hæmorrhoidal veins distended. The nearer the stricture is to the anus, the more is the anal aperture likely to be involved in other changes. In severe cases it becomes patulous, with protrusion of the mucous membrane from the orifice, which sometimes amounts to actual prolapse of the bowel. The frequent discharge of purulent material causes troublesome eczematous eruptions and excoriations of the skin around the anus.

Symptoms.—In cases of stricture following ulceration, there is usually the history of symptoms of variable duration and severity connected with the latter; and when stricture is the result of such constitutional affections as tuberculosis, syphilis, and dysentery, there is also either existing or past evidence of such diseases.

The lesion itself, when at a more or less advanced stage, usually gives rise to a fairly typical train of symptoms. One of the earliest and most troublesome of these is that connected with the increasing obstruction to the normal passage of the fæces. The patient finds that he is unable to get a movement of the bowel without taking an aperient. This perpetual retention of the fæces above the constricted part soon gives rise to additional troubles. The irritation of the mucous membrane causes inflammation and ulceration, with a frequent discharge of blood and pus. The patient is thus frequently induced to go to stool, but the straining efforts induced lead to little more than the ejection of the inflammatory exudation. When fæces are passed they may be in small fragments, scybalous, flattened, or attenuated, their conformation depending principally upon

the tightness and situation of the stricture. Thus, when situated high up, an accumulation may take place in the lower dilated portion of the rectum before evacuation follows.

The more persistent and obstructive the disease the severer become the symptoms, both general and local. The patient suffers from increasing distension of the abdomen, due to the accumulation of fæces within the colon and to the development of flatus. The stomach becomes deranged, so that there is often nausea and distaste for food. Emaciation soon follows, with pallor of skin and derangement of the nervous system; the latter showing itself in sleeplessness and mental depression. Without relief the patient dies of exhaustion unless carried off by some intercurrent complication, such as acute intestinal obstruction or peritonitis.

The amount of pain suffered varies. When severe it is felt not only in the part, but at the back of the sacral region, in the abdomen, and down the thighs. As complications appear, such as abscess formation, feverish symptoms arise, which more or less disappear on the bursting or evacuation of the purulent collection. Other symptoms, however, may then arise dependent upon the creation of fistulous communications either with the exterior of the body or with some viscus internally. The onset of acute intestinal obstruction or acute peritonitis will be indicated by the symptoms usually significant of those conditions.

Diagnosis.—While the symptoms narrated above may lead to a strong suspicion of stricture, it is not until a careful examination has been carried out either by the finger or the bougie that a certain diagnosis can be made.

For all strictures situated within the lower four inches of the rectum digital examination is sufficient; but for those higher up one of three means must be adopted: either the whole hand must be inserted, or the rectum be distended with fluid, or a bougie passed.

For using the hand for purposes of diagnosis see page 416.

Injections are sometimes serviceable when conducted in conjunction with au cultation and palpation of the sigmoid flexure. The obse vation is conducted with the object of determining the quantity of fluid which can be injected

and whether or not it passes upwards into the large intestine. The method is helpful but not certain, since it is open to the objection that the fluid may pass through the stricture and so mislead.

The bougie, next to the hand, affords the most reliable information. It has, however, to be used with care; and is open to the objection that it may mislead by being obstructed in its course by a fold of mucous membrane, or by impinging upon the sacrum.

Three kinds of bougies are used, both for purposes of diagnosis and for treatment. These are represented by Figs. 81–83.

Of these the one with the olive-shaped ivory head and flexible shaft is best for diagnostic purposes. Not only does it render certain the existence of a stricture, but it affords a means of determining its length. When the "olive" has passed through the stricture, the shaft is felt to slip easily backwards and forwards; but on withdrawal it is at once detected when the "olive" re-enters the proximal part of the obstruction, and the grip remains obvious until it is disengaged and enters the dilated bowel below. For directions regarding the passage of bougies see Operations upon the Rectum (chap. lx.). It may be incidentally noted here that the use of a bougie for diagnostic purposes must always be gone about with care, as the bowel wall may be injured to the extent even of fatal perforation.

The true nature of a stricture as to its resistance and resiliency can only be ascertained by the finger. In very tight and hard strictures it is impossible sometimes to insert even the tip of the finger, much less to be able to pass it through.

As a further mechanical aid to diagnosis the speculum may be used.

One symptom which has been mentioned, and which is considered of special value in the diagnosis of stricture high up, is that of so-called "ballooning of the rectum." The condition of expansion or dilatation of the bowel below the stricture has long been recognised, but it is due to Thomas Bryant* more particularly that it has come to occupy a

* *Lancet*, 1889, vol. i. p. 8.

recognised place among the important symptons. By Bryant the condition is considered almost pathognomonic of stenosis, either innocent or malignant, which has been of



FIG. 81.—ROUND-HEADED BOUGIE.



FIG. 82.—CONICAL-HEADED BOUGIE.



FIG. 83.—OLIVE-SHAPED IVORY-HEADED BOUGIE

FIGS. 81–83.—RECTAL BOUGIES. About half natural size.

slow and not rapid formation. The dilatation is supposed to be primarily due to a partial paralysis of the muscular coat, induced by the stricture causing interference with normal peristalsis; and secondarily to distension of the part by gas and fæces.

This symptom, however, cannot, in the light which further investigation has thrown upon it, be considered exclusively distinctive of this kind of disease. Burghard,* out of an examination of 200 patients, found ballooning of the rectum to exist under three different circumstances. First, in cases of stricture of the rectum and sigmoid flexure; secondly, in chronic constipation and fæcal obstruction; and thirdly, in spinal disease. It was never found when the stricture was situated above the lower end of the descending colon.

Prognosis.—Stricture of the rectum is incurable in the sense that, while a patient may be relieved for a variable period, the tendency to recurrence remains a possibility throughout life. If any exceptions can be found to this rule they are among those cases which have been treated by successful excision or by linear proctotomy. The most intractable forms to deal with are those where the bowel is uniformly contracted for a considerable extent. Relief may always be temporarily, if not permanently, afforded; but only at the expense of sacrificing the natural way of defecation for an artificial one.

In slighter cases the regular and intermittent use of bougies may maintain a normal passage for an indefinite period, the patient in many cases being able to enjoy life for so long as it lasts. No kind of stricture is amenable to curative treatment other than that which may be considered of an operative character.

Treatment.—Independently of treatment applied directly to the stricture, much relief may be afforded, especially in the earlier stages of the disease, by careful attention to the diet and condition of the bowels. Food of a rich and indigestible nature is liable to prove irritating to the bowel; a diet therefore as simple and nutritious as possible should be given.

To keep the motions loose a mild laxative should be administered, and when much difficulty exists in obtaining a movement, a slowly introduced enema may effect the desired result.

All measures, however, to deal with the stricture, or with the obstruction to which it has given rise, must be of an

* *Lancet*, 1890, vol. ii. p. 92.

operative nature. The following methods are employed :

1. Dilatation by bougies, tents, and dilators.
2. Electrolysis.
3. Internal proctotomy.
4. External or linear proctotomy.
5. Proctectomy.
6. Inguinal or lumbar anus.

The selection of any one of these methods depends entirely upon the nature of the stricture and the surgeon's aim in treating it.

1. *Treatment by bougies.* — Only strictures of a limited and not very severe type can be thus treated. The dilatation is effected by the daily, or less frequent, passage of bougies of increasing calibre. The good obtained is only temporary, and, to be of any permanent value, must be continued indefinitely at variable intervals, determined chiefly by the tendency which the stricture shows to contract. (For passage of bougies see Operations upon the Rectum, chap. lx.).

The good effects exercised by the pressure of a bougie retained for some time within the stricture has induced Credé * to devise a shape which could be kept in position with a minimum degree of discomfort to the patient. The instrument is shown in Fig. 84. It is made in four sizes. Its chief advantage is supposed to be in the narrowness of the part which rests within the anus, thus causing less dilatation and con-



Fig. 84.—Credé's Rectal Bougie. Natural size, No. 20.

* *Archiv für klin. Chir.* 1892, vol. xliii. p. 175.

sequently less discomfort and pain. The bougies can be retained for periods varying from half an hour to several hours, once or twice daily.

2. *Treatment by electrolysis.*—The success which first attended the treatment of urethral stricture by electrolysis led to its employment in rectal disease. It has not, however, been so uniformly successful that the treatment has received any vary large or general application. Isolated cases of cure are recorded.

3. *Treatment by internal proctotomy.*—The division of a stricture from within has its advocates, and has had its successes; but the operation has always one serious danger. The incision into the tissues allows of the septic infection of the wound by the fæces, and this may lead to troublesome inflammatory complications. In place of one incision right through the stricture, it is sometimes cut in more than one place. The treatment necessitates for its completion the subsequent passage of bougies, which must be continued indefinitely if recontraction is to be prevented.

4. *Treatment by external or linear proctotomy.*—This operation consists in entire division of the stricture and all the parts, including the sphincters, from the tip of the coccyx backwards and downwards. It is employed in cases of severe tubular stricture, where the question becomes one of attempting excision or making an artificial anus. The great advantages of this operation are the immediate relief given to all obstructive symptoms, and the complete drainage afforded. As regards results of the operation, it probably affords the nearest approach of any method to a complete cure. Some cases will not succeed without the subsequent employment of the bougie, and even with this, failure occasionally occurs. In speaking of a cure, no case should be considered as such unless two years at least of freedom from obstruction have elapsed since the operation.

5. *Treatment by excision.*—While this is the most serious of all the operations, it at least aims at being radical. Its two great risks, which almost amount to prohibitive objections are that, should union by granulation of the divided ends of the bowel take place, there is still the grave possibility of another stricture forming as the result of the operation; and should union prove still less satisfactory, serious inflammatory complications may arise, or troublesome fæcal fistulæ

result. By some, however, a sacral anus is considered even preferable to an inguinal or lumbar one. When there is reason to believe that the bowel is much dilated above the stricture, the formation of a temporary artificial anus in the groin will serve the double purpose of giving the distended portion some little time to contract before attempting excision, and remove the irritating and septic effect of the passage of the fæces past the line of union after the operation. When primary union of the divided ends takes place, a practically ideal result is obtained.

6. *Artificial anus.*—This is formed either in the left inguinal or left lumbar region. When symptoms of acute obstruction are present, the operation becomes an imperative one; but, short of such acuteness, the choice of treatment usually lies between this operation and external proctotomy.

CHAPTER LV.

TUMOURS: INNOCENT. POLYPUS.

The rectum is liable to be the seat of various kinds of innocent tumours, which vary in their relative frequency. While differing in structure and in the tissues from which they take their origin, there is a remarkable uniformity in the shape and form which they sooner or later assume. With very few exceptions a tumour developing in or from the wall of the rectum soon becomes a more or less pedunculated growth projecting into the bowel and attached to it by a pedicle, which may be long and narrow or short and broad. This peculiar feature, which has caused these growths to be generically spoken of as polypi, probably owes its origin to the mechanical effect of an intermittent *vis a tergo*. Every time defecation takes place, the growth is pressed upon from above by the descending solid matters; and when once this effect has been produced, it doubtless becomes added to by the natural expulsive efforts of the bowel to rid itself of what it interprets as the presence of foreign matter.

There is another feature worthy of note in connection with these so-called innocent tumours, and that is, that the line of separation between them and malignant growths is not always a very clear and decided one. The subject will be alluded to again, when discussing particular forms of the disease; but the fact is referred to here, so that the preliminary assumption may not be made that every tumour now to be described is necessarily of a purely innocent nature—that is to say, that its removal necessarily implies its non-recurrence and non-extension.

The innocent tumours met with in the rectum are *adenomata*, *fibromata*, *papillomata*, *lymphomata*, *myomata*, *myxomata*, *lipomata*, *cystomata*, *teratomata*, and *angeiomata*.

Adenomata.—By far the largest number of innocent tumours met with are comprised in the class of adenomata. As most frequently met with, they are single tumours, soft in texture, vascular, attached by a narrow pedicle to the rectal wall, and occurring more often in the young than in adults. In size they may vary from a pea to a walnut, and in one typical form they resemble in appearance a raspberry. When the stalk is sufficiently long, or the tumour is attached near the anus, they may project into or through the orifice. When examined microscopically, they are found to be purely glandular in structure, the glands resembling those of other parts of the mucous membrane, except that they show much irregularity in their disposition, and considerable differences in size. Blood vessels pass through the pedicle to and from the body of the tumour; and when the arteries are of any size their pulsation can be easily felt. While this form of polypus is most frequently met with singly, exceptional instances occur where they are disseminated or multiple. These are more fully referred to below.

The extraordinary resemblance which exists between the microscopic characters of these so-called innocent glandular polypi and the malignant columnar-celled carcinoma or adenoid cancers naturally raises the question as to the possibility of any connection existing between the two Histologically the one grows out from the wall of the bowel, while the other grows into it; but it is probable that some more cogent factor is at work determining the peculiar invading features of the one than is simply represented by what otherwise appears almost accidental.

Fibromata.—Tumours of this character are almost as common as those of the preceding variety. Together with them they may be considered as constituting what is specifically and commonly known as polypus of the rectum. In all points except in their intimate structure they resemble the adenoid polypus, being rounded in shape, and attached to the bowel wall by a pedicle of variable length and size. They usually exist singly, but in exceptional instances are multiple (see below). When examined microscopically, they are found to consist of fibrous tissue of varying degrees of density, covered over by normal mucous membrane.

Papillomata, or villous tumour.—This form of tumour is a rare but well-recognised and distinct type of growth. It constitutes one of those forms which occupy the boundary line between what are considered definitely innocent and those that are described as distinctly malignant. For while the growth in its initial state seems to lack the features of typical malignancy in not extending beyond its original seat, it does appear to resemble carcinoma in occasionally returning after removal, and then presenting sometimes the characteristics of epithelioma.

The papillomata are frequently pedunculated, but as frequently sessile. In the former case the peduncle is usually broader than in the more commonly met with adenoid or fibrous polypus. In their minute structure they resemble the adenomata, but present a more irregular surface than the latter, being "composed of compactly applied, various shapen processes, sometimes dendritic, at others flat and leafy, and comparatively simple in form" (Shattock). They are very vascular, and prone to bleed, large quantities of blood being sometimes lost. As another distinguishing feature from the common form of polypus, they are only met with in adults, and not infrequently in old people.

Multiple polypi.—All three of the preceding varieties of growths, as also that of the variety which immediately follows, may be met with as more or less disseminated or multiple tumours throughout the rectum. The two former, however—the adenoid and the fibrous—constitute those most frequently met with. The disease is a rare one, but numerous cases are recorded. Why the wall of the rectum

should thus become converted into a surface having numerous pendulous projections hanging from it, it is not possible to say; but in these extreme cases it frequently happens that not only is the rectum involved, but the diseased condition extends up into the large bowel above. There is reason to suppose that the disease is in some sense hereditary or constitutional, for other members of the family have been known to suffer from the same disease.

In most of the recorded cases it would appear that the disease is most frequently met with at the earlier period of life.

Lymphomata.—It occasionally, though rarely, happens that what is clinically diagnosed as a common adenoid or fibrous polypus turns out on microscopical examination to be composed entirely of lymphatic tissue. In these cases it is probable that the polypi have their origin in the solitary glands of the mucous membrane.

Myomata.—Tumours developing in the muscular coat of the bowel, and composed either wholly of muscle, or of this in combination with fibrous tissue, are sometimes met with.

Myxomata, Teratomata, Angeiomata or Nævus.—Tumours of this character are of the nature of curiosities rather than otherwise, so rarely are they encountered in practice.

Symptoms.—In most cases the symptoms associated with an innocent tumour in the rectum are dependent upon the particular configuration of the growth rather than upon its histology; that is to say, a tumour hanging by a pedicle, in other words a polypus, will produce symptoms much the same whether it be composed of glandular tissue, fibrous tissue, lymphatic tissue, or any one of the other connective tissues. The same may be said of tumours which do not become pendulous, but which project into the canal and cause mechanical obstruction.

The presence of a polypus in the rectum is usually manifested by frequent discharges of mucous, usually of thin consistency and often fetid, and by the occasional escape of blood. When the pedicle of the polypus is long, the body of the tumour is sometimes extruded from the anus, and if sufficiently tightly constricted it becomes congested, or may get severed from its attachment. The larger the size of

the polypus the more apt it is to create a feeling of discomfort within the bowel, and to cause the sensation of imperfect evacuation after defecation.

The severity of the symptoms depend almost entirely upon the size of the tumour, its vascularity, and the extent of the mucous membrane involved. Thus it usually happens that the villous growth, which is very vascular, and exposes by its irregular papillomatous surface a large extent of secreting mucous membrane, causes more bleeding and more mucous discharge than is met with in the adenoid or fibrous polypus. The amount of mucous discharged is sometimes seen by the inability of the patient to prevent a constant leakage through the anus when moving about in the erect position.

In many instances tumours growing from the rectal wall and projecting into the lumen of the bowel cause obstruction; but acute intestinal obstruction is rarely met with.

Diagnosis.—When the tumour projects from the anus it is liable to be mistaken for a pile, but a closer examination will reveal its true nature. There is also a danger of regarding the occasional hæmorrhage as an indication of the same disease, and the mistake may not be discovered until a proper examination is made. The introduction of the speculum will in many cases bring a tumour into view; but palpation by the finger, when possible, gives the fullest information. In using the finger a systematic examination of the rectum should be made, otherwise the polypus may escape detection. A polypus with a long pedicle may have its body carried upwards out of reach, and this even may be done at the time of inserting the finger. The existence of a cordlike structure will sometimes indicate that the body of the tumour has been thus displaced, and by hooking the finger around it the tumour may be brought within touch. Better information is therefore obtained when withdrawing rather than when inserting the finger. Straining on the part of the patient, or the administration of an enema, will often help to bring down a growth and admit of its being seen or felt.

The base of attachment of the tumour should always be carefully noted, for the treatment to be subsequently adopted depends upon the breadth of this connection.

Prognosis.—The tendency of all polypi is to increase in

size, and for the pedicle to increase in length. This elongation of the pedicle sooner or later admits of the extrusion of the body of the tumour through the anus during the act of defecation, and as a result the veins in the pedicle become obstructed. The tumour then becomes swollen and congested, and if much enlarged is prevented from being reduced within the bowel. A tumour so strangulated is sometimes severed from its connection, and a natural cure results.

No truly innocent tumour returns after complete removal. The doubtfully innocent nature of villous growths has already been alluded to, where recurrence has taken place after removal, and the new growth has manifested the characters of epithelioma.

One of the tendencies of a polypus is to produce prolapse of the bowel; in this the growth exercises a similar action to what occasionally happens in both the large and small intestine. The constant dragging action of the tumour in these latter regions causes intussusception.

Treatment.—Removal is the only method of successful treatment. In many cases of simple polypus it is easy to pull down the tumour, encircle the pedicle with a ligature, and snip off the mass with a pair of scissors. If the pedicle be long and narrow it may be twisted off with a pair of forceps. The broader the pedicle the greater the care needed in securing it, as vessels of considerable size sometimes pass from the mucous membrane into the body of the growth.

When from the position of the tumour, or the breadth of its basal attachment, it cannot be dealt with simply, the sphincter should be dilated and the base of the growth transfixed with needle and suture. A broad pedicle should be ligatured preferably in two or more portions rather than encircled by a single thread.

When the pedicle has been tied, the tumour may either be cut away or left to slough off. It is, however, far preferable to adopt the former plan, and if any bleeding points are seen to exist after the excision, they should be seized separately with a pair of artery forceps, and ligatured.

CHAPTER LVI.

TUMOURS (*continued*): MALIGNANT. CARCINOMA AND SARCOMA.

Of the two large classes of malignant tumours, the carcinomata and the sarcomata, the former affects the rectum out of all proportion to the latter; while the one is comparatively common, the other is only met with in rare and isolated instances.

The disease attacks both males and females, but with a frequency slightly greater in the case of the former.

As regards age, the disease is essentially one of adult life, and is met with at any period after twenty years. Cases, however, are not wanting to illustrate its appearance in patients considerably under this age.

Pathology.—It was pointed out before discussing the pathology of carcinoma of the large bowel that, prior to speaking of the various kinds of carcinoma which may involve the gut, some definite understanding must be had of the significance of the terms used. The same reasoning equally applies here, and the reader is asked to refer to page 337 for a description which need not be repeated.

Adopting therefore the threefold classification of carcinoma — the squamous-celled, spheroidal-celled, and columnar-celled—the rectum appears to be affected almost exclusively by the last. In almost every instance where the record of a case carries with it the microscopical description of the growth, the disease is described as of this character. And where such terms as "scirrhous," "medullary," or "encephaloid" are used they invariably have a clinical, and not a strictly histological, significance; that is to say, the terms are intended to imply either that the tumour tissue is indurated and possibly of slow growth, or that it is soft, pulpy, and probably rapidly growing.

Carcinoma of the rectum, as just indicated, presents many differences in its character. Both as regards its origin and its development marked variations are met with.

Why a tumour presenting in its intimate structure such constant uniformity should, in process of development, exhibit such striking differences, it is impossible to say. But the reason, whether a constitutional or a local one, is probably the same as that which effects similar modifications in the growth of carcinoma in other parts of the body ; and until more is known generally about the etiology of carcinoma, it is impossible to attempt to explain the numerous and variable phases which it presents in its process of development.

In the origin and progress of carcinomatous disease two special forms are described by Cripps :* the one known as the "laminar" is characterised by its tendency to spread as a thin layer between the mucous and muscular coats of the bowel ; this form finally gives rise to the well-recognised annular stricture. The other form tends to increase uniformly in all directions both superficially and deeply, and by so doing to produce a tumour which projects into the bowel ; the mucous membrane at an early stage covers the tumour, but sooner or later it gives way, and an ulcerating mass projects which may be as soft as brain tissue.

Of these two types of disease the laminar—or, as it is better known in its more advanced stage, the annular stricture—is the commoner.

Carcinoma is met with in any part of the rectum, but appears to be more frequently seated within the first two or three inches from the anus.

The appearance under the microscope of a section of rectal carcinoma is usually very typical. In general structure it presents the character of a gland, and so constantly is this character present that it has received the name of "malignant adenoma," or "adenoid carcinoma." A section shows numerous elongated or round tubular structures irregularly disposed and of somewhat unequal calibre. In most sections a uniform layer of columnar-shaped cells is seen lining the tubular or alveolar spaces ; it is frequent, however, to see gaps in the lining, due to the dislodgment of cells in the process of mounting. The tubuli and alveoli are filled with cells, but these also are liable to be washed away and leave clear and empty spaces.

* Page 321.

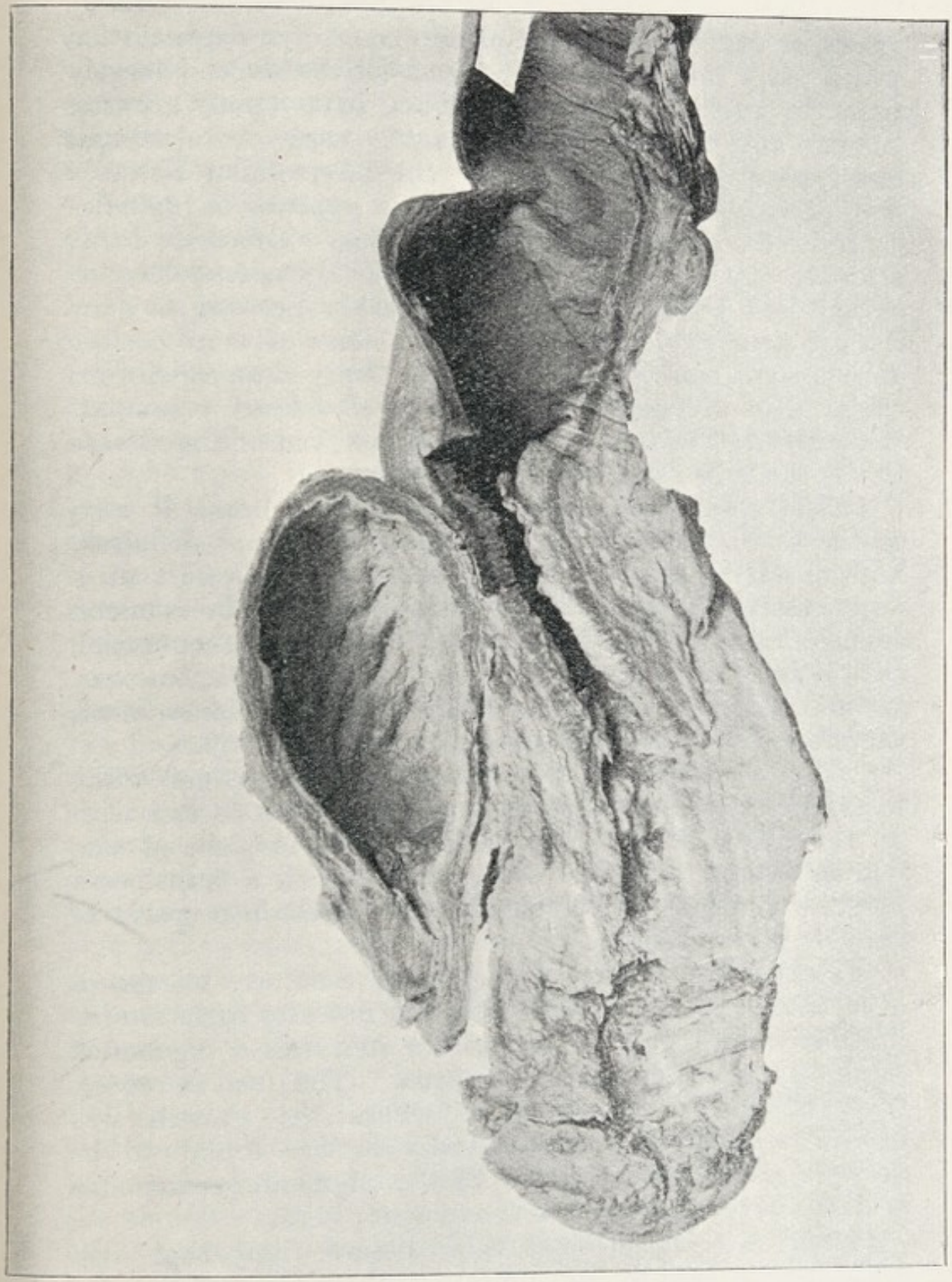


FIG. 85.—COLLOID CARCINOMA OF RECTUM.—The illustration shows a longitudinal section of the rectum with the bladder in front. The wall of the rectum is thickened and infiltrated. (*W.I.M., Glas.*)

The relative proportion of cells and inter-cellular tissue varies, as does also the stage of development or degeneration which each may reach. These variations depend largely upon the rapidity of growth. Thus in a rapidly growing tumour the cells are proportionately more abundant and less typical in character; while the intercellular tissue is less perfectly developed, and often appears as spindle-shaped cells rather than as fibrous tissue. Tumours of this character form what are known clinically as medullary or encephaloid growths. In a more slowly growing tumour the two primary constituents reach a stage of more perfect development, and the intercellular fully formed fibrous tissue may predominate over the well-defined columnar-shaped cells. In the so-called scirrhous form of the disease this is the type most usually met with.

Colloid carcinoma.—What relation this bears, if any, to the form of carcinoma just described is not definitely known. If it may be looked upon as the result of a degenerative change in the columnar cells of the common adenoid form of the disease, its pathological connection with it becomes at once simplified. Pathologists, however, are not at one on such an explanation, and the disease must, therefore, for the present be considered separately.

Colloid carcinoma of the rectum is but rarely met with; in structure it follows the type of the growth as met with in other parts of the body. The stroma, in place of containing typical epithelial cells, is filled with a translucent jellylike material which distends the loculi into spaces of variable size and shape.

Melanotic carcinoma.—While many cases are on record of melanotic cancer of the bowel, it is not easy to determine whether in all cases this expression indicates a pigmented carcinoma or a pigmented sarcoma. The fact, however, that in nearly every instance where the growth was carefully examined microscopically it was found to be sarcoma renders it probable that a pigmented carcinoma is either never met with or is extremely rare.

Osteoid carcinoma.—As this disease, like that just described, is usually indefinitely spoken of as a cancer, it is possible that it, too, should be considered as of the nature of a sarcoma. The disease, however, is of exceptional rarity.

Progress of the disease.—The course which carcinoma pursues resembles that followed by it when occurring in other parts of the alimentary tract, modified only by the special anatomical relations of the region affected. Its progress may be considered from two aspects, the local and the remote.

Locally the disease as it develops affects in the first place the bowel itself, and then, by direct extension, the parts in the immediate neighbourhood.

The manner in which the bowel is affected depends principally upon the nature of the growth. It may block the canal either by projecting into it as a mass of tumour tissue, or by constricting it with a hard and resistant fibrous-like band. When the obstruction is brought about by projecting masses these sooner or later break down and leave large ulcers, and fungating masses of tissue which frequently bleed freely. When the growth extends backwards into the hollow of the sacrum, it may press upon or invade the sacral plexus, and by so doing be the cause of pain felt in the peripheral distribution of the nerves derived from it. Thus that kind of pain so often described by the patient as like rheumatism or sciatica may owe its existence to some such implication. In the case of stricture, other changes are brought about by the constant and increasing obstruction to the passage downwards of the contents of the bowel above the stricture. These resemble those already described in the case of non-malignant stricture, and consist of dilatation of the bowel above the obstruction, with inflammation and ulceration the result of constant fæcal irritation. Ulceration may take place at any part of the large intestine, and not necessarily immediately above the stricture. If ulceration progresses it may lead to rupture or perforation.

Ulceration may also lead to the contraction of adhesions between the rectum and neighbouring viscera, and in this way localised abscesses sometimes form which, bursting into the bladder, urethra, vagina, or uterus, establish a fistulous communication. Such results as recto-vesical fistulæ are not uncommon, and cause much suffering in micturition. When ulceration extends into the ischio-rectal fossæ, acute inflammation and suppuration follow, with the result that one of the worst forms of fistula in ano

is caused. In one such case, upon which I operated, the patient was admitted into the hospital with extensive acute inflammation commencing in the region of the anus and extending for some distance over both buttocks. When freely incised, a quantity of gas and excessively putrid-smelling fæces escaped, and a large cavity was left with shreddy sloughs adherent to its walls, and laying bare the coccyx.

In rare instances the abscess, instead of bursting externally, reopens into the bowel below the stricture, and thus, as happens in the urethra, a new channel is opened up for the discharge of the hitherto obstructed fæces.

In cases of ring stricture it occasionally happens that the narrowed orifice becomes suddenly blocked, and symptoms of obstruction set in which are not necessarily acute in character, but tend to be so the higher the seat of obstruction. Another cause of intestinal obstruction is the formation of a rectal intussusception. The constant efforts on the part of the bowel above to drive on its contents causes the strictured ring to descend; and, although usually more or less gradual in its process, it may suddenly amount to a complete intussusception, with the result of creating an impervious canal.

The bowel below the seat of obstruction also suffers from changes similar to those described in connection with simple cicatricial stricture. When the disease is situated high up in the rectum, the portion below often becomes "ballooned," the cavity of the bowel being markedly expanded, and for the same reason as already explained in discussing the conditions in simple stricture (see page 438). Internal hæmorrhoids are frequently present; and when the disease is situated low down, the anus may be invaded or may be patulous and œdematous, and possibly excoriated by the constant escape of putrid and irritating discharges.

In considering the remote changes effected by the progress of the disease, the anatomy of the part must be borne in mind. The fact that carcinoma may be carried into distant parts, both by the lymphatics and by the veins, renders it important to consider the course which these vessels take in their passage from the initial seat of the disease. By reference to the anatomy of the rectum it will be found that the lymphatics from all parts of the rectum

above the anus proceed to the sacral glands in the hollow of the sacrum and to the lumbar glands along the sides of the lumbar vertebræ; while the veins return their blood into the portal vein and into the inferior vena cava. Hence, in seeking to ascertain if the lymphatic glands are enlarged, the sacral glands must be examined through the posterior wall of the rectum and the lumbar glands by pressure exercised through the anterior abdominal wall. These glands sometimes enlarge to the size of a hen's egg or even larger, and can then be easily felt.

In distribution of the disease by the veins, the liver is the first to become involved, and in some instances so markedly does this involvement take place that its large size and nodular and irregular outline constitute a prominent feature in the case. Systematic infection through the vena cava is shown by involvement of the lung and other parts of the body.

Another effect of the absorption into the blood of substances connected with the growth is the production of a peculiar sallow complexion, the so-called cachexia. This is usually considered a feature of some diagnostic value in all cases of advanced carcinoma but more particularly is it so in rectal disease.

Symptoms.—Like most diseases involving the alimentary tract, the early symptoms are often of an extremely vague and uncertain character. It is, as a rule, not until a comparatively advanced period that symptoms in any degree typical of the disease are present.

As will be gathered from what has been said in connection with the pathology of the disease, there can be no uniformity or constancy in the symptoms manifested. The nature of the growth, its seat and extent, affect as much as anything the symptoms present; and if to these be added the natural differences of susceptibility which patients exhibit regarding discomforts and pain, it will at once be seen how extremely variable must be the symptoms present in each case.

Constipation and diarrhœa.—Among the earliest indications of the disease, and more particularly of that form of it which results in the annular or ring stricture, is gradually increasing difficulty in defecation. The onset and progress of the difficulty is naturally very insidious, and it is only

when the patient begins to find it needful to render the motions lax by aperients, in order to get a passage, that a suspicion is entertained regarding the possible nature of the complaint. It is often also at this early stage that some little bleeding is frequently noticed; and the patient is misled into the belief that the hæmorrhage is the result of piles. When obstruction has reached a certain stage, a spurious diarrhœa often sets in, and the patient is compelled to make frequent efforts to empty the bowel, although little more than some blood-stained muco-purulent material may be discharged.

The *fæces* in their character frequently constitute an important diagnostic feature in the disease. When the obstruction is situated low down in the rectum, the motions may be modified in shape. They may be flattened, narrowed like pipe-stems, or grooved. If the obstruction is higher, they may be entirely wanting in form. In most cases where the disease is at all advanced, the motions are loose, and coated or streaked or mixed with blood-stained mucous or possibly with pus. The amount of blood lost varies, but is as a rule small in quantity. The excessively offensive smell of the discharges observed in some cases constitutes almost a pathognomonic sign of carcinoma.

The *pain* felt is extremely variable, both in kind and in intensity. In some cases it is so slight that not until within a short time before death is any complaint made. Unfortunately this complete absence of pain is the exception rather than the rule. Pain of some kind is generally felt throughout the disease, and in many instances it becomes of such a severe and constant character that there are few troubles which cause acuter suffering. The simplest type of pain is that which consists in little more than a constant feeling of discomfort at not being able successfully to empty the bowel. The existence of ulceration and involvement of nerves probably accounts for the severer types of pain. The patient complains of a feeling of "burning," which is often worse after a movement of the bowels; or there is a constant sensation of weight in the part, with possibly a dull gnawing pain at the back of the sacrum. When the pain is reflected down the legs, it is sometimes described as sciatica. Occasionally pain is complained of in the abdomen.

Other symptoms become manifest as the disease progresses

and produces its various complications. The complexion of the patient is frequently markedly sallow; loss of sleep and loss of appetite co-exist with loss of flesh and loss of strength. There may be enlargement of the liver, with possibly some irregularity of its edge and surface. Deep palpation of the abdomen, either with or without an anæsthetic, may also reveal the presence of enlarged lymphatic glands. The increasing obstruction may cause distension of the abdomen, and griping pains will indicate the fruitless efforts of the peristaltic wave to overcome the obstruction. If complete blockage of the narrowed channel should take place, symptoms of intestinal obstruction follow. As a rule these are not of the same acute character as when the bowel is obstructed in the colon or small intestine, and may be said to be less severe the lower the disease is situated in the rectum. It is not uncommon for vomiting to continue for several days before it becomes fæcal, and for the patient during this time not to be particularly distressed or put about.

The sudden onset of acute abdominal pain, in a patient not otherwise very ill, must be considered as probably indicating rupture or perforation of the bowel above the obstruction.

Diagnosis.—Diagnosis of carcinoma of the rectum cannot be said to be rendered perfectly certain unless the disease can be either seen or felt. Hence it follows that it is only when it is seated within the lower six inches of the gut that a definite opinion can be expressed. The reason of this arises from the fact that, when a carcinomatous stricture involves the upper part of the rectum, its differential diagnosis from obstruction due to simple stricture is very difficult, and at the most can only be conjectured from such facts as the age of the patient, the length of time the symptoms have existed, and the general appearances and conditions represented.

When the finger can reach the seat of the disease, what is felt will depend upon the nature and extent of the growth. In any case of doubt it is possible to remove, either with the finger-nail or with a forceps, a small piece of the tumour tissue for microscopic examination. When the finger cannot reach the disease, it may be possible to see it with a speculum, and to verify the diagnosis by the removal of a fragment for examination.

Cripps attaches some weight, in distinguishing between an innocent and a malignant stricture, to the condition of the mucous membrane between the anus and the strictured part. In the former the mucous membrane is somewhat hard and contracted, portions of it instead of feeling soft and supple are often hard and creaking, as if replaced by cicatricial tissue; while in the latter the mucous membrane is generally comparatively healthy.

Assistance in the diagnosis of a stricture in the upper part of the rectum may be obtained by the method of injection, by the use of bougies, and by the presence of "ballooning" of the bowel below. Reference should be made to these diagnostic measures when discussed in connection with non-malignant stricture. It should, however, be briefly repeated here that bougies, if employed at all, must be used with the utmost care; for if there is danger of perforating the bowel in simple stricture, much more is this the case in malignant disease.

Prognosis.—The inevitably fatal nature of the disease renders the question of prognosis one dependent upon the relative merits of the different modes of treatment. The question becomes one simply of determining how much longer a patient can live after treatment than if no treatment had been adopted.

As regards length of life independently of treatment of any kind—that is to say, the length of time the disease takes to run its natural course—great differences necessarily exist. For not only are there innumerable variations in the modes of involvement of the bowel, and in the rapidity with which the growth progresses and implicates other parts, but the greatest possible difficulty exists in fixing the period at which the disease commenced. Cases are recorded where the first symptoms experienced by the patient were those of acute intestinal obstruction—in other words, the patient had lived in apparent health, with little or no indication of the disease which was slowly progressing and shortly to terminate in death. As a rule, the younger the patient the more rapid is the progress of the disease; hence in old people we find that life is often much prolonged. It may be approximately said that the patient lives for about a couple of years after the first appearance of the disease as manifested by symptoms. Death then results from

exhaustion. Should complications arise they may hasten the end, and if these are of the nature of complete obstruction or perforation a more or less rapidly fatal result ensues.

Prognosis in regard to treatment concerns, in the first place, simply the relief of the patient's symptoms, and, in the second, the possibility of curing the disease.

No subject in surgery has afforded a field for keener conflict than that which concerns the operative treatment of this disease. The contending parties are those who advocate the formation of an artificial anus either in the groin or in the loin, and those who advise radical treatment by extirpation. The aims are totally distinct, and, as the means to procure the ends differ so widely in their nature and severity, it must be clearly shown that the severer measure of extirpation justifies the rejection in certain cases of the comparatively safe and purely palliative operation of making an artificial anus.

In discussing the merits of extirpation, the two primary methods of operating must be considered separately. These methods are the removal of the disease when situated in the lower half of the rectum, by operating through the perineum; and removal of the disease when seated in the upper half, by operating through the sacral region. The greater magnitude of the latter operation necessarily causes it to rank as the severer method of the two.

In weighing the merits of either of these operations, it must be understood that in both suitable cases are selected for the treatment. Incomplete removal of the primary seat of the disease in carcinoma, occurring in any part of the body, is invariably followed by conditions worse than those for which the operation was originally performed. This specially applies to disease in the rectum, where the part of the tumour left behind takes on a renewed activity in growth, and recontraction readily follows with a return, in possibly an augmented condition, of the original symptoms.

I will consider first, *prognosis in the perineal operation*, supposing that, as far as possible, suitable cases are selected —that is to say, cases in which, from the locality, mobility, and general nature of the growth, the surgeon believes its total removal from the perineum possible.

Great difficulty attaches to reasoning from statistics; unless the character of each case is clearly reported, there is the great probability that, in many instances, attempts at removal will have been made where the untoward results sufficiently indicate that operation should not have been performed. I have, however, been able to collect statistics from two sources which seem to supply the requisite data. They are those of Cripps of London, and Czerny of Heidelberg, both surgeons of recognised repute, and whose cases are carefully selected.

Cripps* excised the rectum from the perineum in 38 cases; 3 died and 35 recovered from the immediate effects of the operation, giving a mortality of 7·8 per cent. Seven lived beyond the usual three-year limit; among these, however, were three in which some recurrence took place, but which in each was successfully removed.

Czerny's cases† are collected from the six years between 1886 and 1891, and were published by Schmidt in 1892. It is not therefore possible to give the complete number of cases which might pass beyond the three-year limit, nor to state how much longer than the period included any particular case which had passed the cure-limit might live.

These six years embrace thirty-two operations by the perineal method with one death, thus giving a mortality of 3·1 per cent. as directly the result of the operation. Of sixteen cases which had died, the duration of their life after the operation amounted on an average to two years; the longest duration was four years. Nothing was known about four patients.

Lövinsohn's cases‡ are collected from Czerny's Heidelberg clinic between the years of 1883 and 1886, and are sixteen in number; they were published in 1893. One patient died of collapse, the direct result of the operation, giving a percentage mortality of 6·2. Six lived for four years and longer. Of these six cases all died, with the exception of two, of a recurrence of the disease. The two exceptions are those of $6\frac{3}{4}$ years and $8\frac{3}{4}$ years, where it is

* *Brit. Med. Journ.* 1892, vol. i. p. 1277.
† *Beiträge zur klin. Chir.* 1892, Bd. ix. Heft ii, p. 409.
‡ *Ibid.* 1893, Bd. x. p. 223.

noted that the patients were alive and free from any sign of return. In one of the cases which lived for four years, the recurrence took place in the liver.

The inferences to be derived from these statistics are (1) that the operation itself is not a fatal one, the mean percentage of mortality of these two operators being 5·3; (2) that prolongation of life is possible in suitably selected cases; (3) that extirpation of the disease with permanent cure is comparatively rare.

Prognosis in the sacral operation is in many respects much more difficult and much graver than in the case of the perineal operation. In the first place the operation deals with disease in a part of the bowel where there is much difficulty in deciding the character and extent of the growth, and therefore the possibility of its complete removal. Still further, it is impossible to foresee how far the result of the operation may correspond to what was aimed at, and how far the subsequent conditions may even be aggravated by the operation.

The question may be first asked, What are the results which may follow this method of excision apart from those connected directly with the operation and those concerning the possibility of effecting a cure?

The most favourable result, apart from the question of total removal of the disease, and that unfortunately least often obtained, is complete control of the bowel. How this may be effected independently of the retention of the normal sphincters will be described under the section of operations. Suffice it to say here, however, that in by far the large proportion of cases there is incontinence of fæces to a greater or less extent. In many instances fæcal fistulæ form in some part of the posterior wound; in not a few also, these fistulæ enlarge until they form the sole exit for the discharge. Again, it may be found, after the removal of the growth, that it is impossible to retain the anal section of the gut, or even to bring down sufficiently the upper segment in order to attach it below. In such cases a sacral anus has to be established. As a last remote effect may be mentioned cicatricial contraction, and consequent obstruction.

Following more directly upon the operation are results dependent upon septic infection of the wound. These, fortunately, have not been of a very frequent character;

and, although possible, they need not be introduced as arguments of much cogency against its performance.

Now, as regards the mortality of the operation and the possibility of obtaining a cure.

In Czerny's series of 36 cases operated upon by the sacral method there were 7 deaths due directly to the operation, giving a mortality of 19·4 per cent. There were living at the time the report was made 18. Of these

6 { 3 after $2\frac{3}{4}$ years
  { 1 ,, $2\frac{1}{3}$,,
  { 2 ,, 2 ,,

12 from $1\frac{3}{4}$ year to 5 months.

Nine had died from recurrence, metastases, &c., within the period over which the series extends—that is, six years. Some of these cases are reported as being in good health and as having returned to their accustomed work.

From this series it will be seen that there is no record of any having passed the three-year limit, although it is quite possible that some may have done so by this time.

The question regarding this operation now comes to be one of determining whether the good that it can effect sufficiently outweighs the untoward results that frequently follow; in other words, does the prolongation of life and the relief of suffering more than compensate for the lives it shortens, and the often additional troubles it causes? It need hardly be said that the question is one of extreme difficulty; for even if it could be shown that Czerny's results gave a balance in favour of the operation in supposed suitable cases, it far from follows that less experienced operators, in such a grave and comparatively difficult operation, would obtain like good results. Indeed, if one may judge from isolated instances recorded—and it may reasonably be accepted that it is mostly the successful cases which are published—results argue rather against than for the operation. And as regards opinions, most surgeons, in this country at least, are not disposed to give it more than a scanty recognition and a comparatively limited application.

That, however, it is possible to remove the disease entirely and leave the patient in comparative enjoyment of health and with the ability to do his ordinary work in daily life, is a sufficient justification for the operation *per se*. It only

remains for the surgeon to consider, in attempting to gain such a desirable end, whether the case, in the first place, appears to him a really suitable one; and whether, in the second, he is prepared to recommend it to his patient in the face of the various risks and the untoward results which are not only possible, but proportionately probable to the limited experience he may have had in performing the operation.

Prognosis in regard to the formation of an artificial anus is less difficult to give than in the preceding cases, for the operation no longer concerns the question of cure, but simply that of relief. Life may also be prolonged, in so far as it is affected by the relief to suffering, and the warding off of dangerous complications.

The operation, whether performed in the groin or in the lumbar region, is of such a simple and safe character that of itself it need not be considered as affecting the prognosis. When it has proved fatal it has usually been in cases of extreme gravity, such as in operations upon patients far gone with symptoms of intestinal obstruction.

In forecasting the result of the operation, it may be said to give immediate relief in most instances by lessening the pain and removing the obstruction; but it adds the inconvenience and discomfort necessarily connected with the involuntary exit of fæces in the groin or in the loin. As a rule patients are ready to face these inconveniences rather than endure the suffering which comes of inability to get a proper movement of the bowels.

As regards the effect an artificial anus has in prolonging life, much must depend upon the nature of the disease and the condition of the patient. By the performance of the operation upon a patient on the verge of death from obstruction, life is not only prolonged, but actually saved. On the other hand, to make an anus merely because a patient has malignant disease, from which he neither suffers nor is inconvenienced, would be to add a discomfort, without probably in any way checking the onward progress of the tumour. If, however, the patient is slowly sinking from the pain and trouble associated with the passage of fæces over the part, there is little doubt that life will be spared for a longer period than if the operation had not been performed.

Treatment.—Sufficient has been said regarding the pathology, symptoms, and prognosis of the disease to indicate how largely treatment must depend upon the circumstance of each individual case. It is possible, however, to simplify the discussion of the subject by making a primary division of the cases to be treated into those which are operable and those which are not, and then subdividing the former into cases suitable for extirpation and those best fitted for the formation of an artificial anus.

Treatment of non-operable cases.—In this class of cases are included all those which are considered too advanced for any purpose to be served by subjecting the patient to an operation, and those who refuse to have anything done.

The treatment necessary concerns the relief of the symptoms by palliative or conservative measures. Prominent among these must be the regulation of the bowels and the adoption of a suitable diet. Mild laxatives should be administered. A morning draught of one of the aperient waters is often of much service in this respect. In diet nothing should be taken which is liable to irritate the bowel or tend to produce constipation.

When there is much offensive and irritating discharge from the diseased part, cleanliness is of much importance, not only in lessening the deleterious effects such discharges have by absorption upon the general health of the patient, but in preventing the excessively painful fissures and excoriations which form in and around the anus. Injections of warm antiseptic solutions should be frequently used. Condy's fluid, largely diluted, acts as a powerful deodoriser. A sitz bath is also serviceable; and the occasional insertion of an iodoform suppository is sometimes useful.

The relief of pain is of paramount importance, and should be treated with some consideration. The administration of opium and its preparations, either hypodermically or as suppository, will in most instances give the required relief; but if its administration is commenced at an early period of the disease, the original dose soon begins to fail in producing its effect; so that while the pain increases, the influence of the drug diminishes. Hence, to give the necessary relief, the amount has to be increased. The gradual addition to the quantity administered is liable to produce a craving for the drug, and this becomes so intense

in some cases that patients have been known to confess that the suffering connected with the insatiable desire for the drug was worse than that associated with the disease. To guard against such a result opium should be kept as a last resource, and then, when given, only the smallest dose capable of producing the desired effect. This rule also applies to every addition that is made to the strength of the dose. Among sedatives which may be locally applied for the relief of pain are cocaine, hyoscyamine, and belladonna.

Two other measures must be considered, which occupy a position, however, somewhat between the purely conservative and the purely operative: these are relief of the obstruction by division of the stricture either partially or completely, and curetting or scooping away the tumour when of a sufficiently soft character.

Partial division of the stricture, by incising it in one or two places, must be followed up by the use of bougies.

Complete division or the performance of linear or posterior proctotomy will give temporary relief, but inasmuch as the operation involves division of the sphincters, fæcal incontinence must follow.

Treatment of operable cases.—Which of the two operations should be performed in any case—that is to say, extirpation or the formation of an artificial anus—must be decided solely on grounds of whether or not it is considered possible to remove the whole primary seat of the disease.

When the question concerns the performance of the perineal operation, it is not usually very difficult to decide. In these cases the seat of the disease is open to careful inspection, and it is approximately possible to determine the extent of the bowel involved, both superficially and deeply. When the growth is localised or the stricture limited, removal may be considered the proper course to adopt if in neither case there is any indication of fixation of the part to the deeper structures. Thus if it is fixed to the sacrum, or to the bladder, prostate, or urethra in the male, and the vagina or uterus in the female, the case is not a suitable one for extirpation unless the surgeon is prepared to go to great lengths and freely remove all parts which appear involved, heedless of the consequences which may result, so long as the disease is removed. It may, however, well be doubted whether such mutilation is justi-

fied, considering the wretched state in which the patient must be left and the extreme improbability of eradicating the disease.

When the question is one concerning the performance of the sacral operation, much depends not only on the more or less conjectural opinion regarding the nature and extent of the growth, but upon the general condition of the patient. The operation is a severe one, and the shock often considerable; hence, while the diseased part may seem suitable for removal, the patient's strength may not be deemed equal to the possible loss of blood and the shock which its performance will probably entail.

There are certain other conditions which may be considered as practically inhibitory to the performance of extirpation by either method. These are the existence of obviously enlarged glands, either in the sacrum or in the abdomen, along the lumbar spine; marked enlargement of the liver, with possibly ascites; advanced disease, as shown by a marked cachexia and general loss of flesh and strength; fistulous communication with bladder, urethra, vagina, or uterus; and in cases of acute intestinal obstruction when urgent relief is required.

If extirpation is not deemed advisable from any of the causes above given, the question then becomes one regarding the formation of an artificial anus. In cases of acute obstruction or recto-vesical fistulæ, an artificial anus should be made; but, short of such complication, the operation is one to be selected by the patient rather than urged by the surgeon. The possibility of relief and the prolongation of life, as well as the converse possibilities, and the additional inconveniences of an incontrollable fæcal orifice must all be honestly placed before the patient, with such opinions as the surgeon may feel justified in expressing from his experience, and his knowledge of the nature and extent of the disease.

Sarcoma.—Sarcoma is rarely met with as one of the forms of malignant disease attacking the rectum. A few cases of spindle-celled sarcoma have been recorded, otherwise the type usually met with is that of the melanotic.

CHAPTER LVII.

PROLAPSE. INTUSSUSCEPTION. RECTAL HERNIA. RECTOCELE.

Prolapse.—The protrusion beyond the anus of any portion of the bowel constitutes a prolapse; and inasmuch as this protrusion may vary between a slight eversion of the mucous membrane and a complete turning out of the whole rectum, two terms have been introduced to signify the more or less opposite extremes. Thus, when only the mucous membrane is everted for a short distance, the condition is termed *prolapsus ani;* and when the bowel is everted it is called *procidentia recti.* Between these two extremes, however, there is every gradation; and in order to include those forms which do not come strictly under either of the two already given, a division is sometimes made into *partial prolapse* and *complete prolapse* of the rectum.

The condition may be met with at any period of life, but is more frequent at the two extremes. In the young the various degrees of partial prolapse are mostly seen; while in the old the prolapse tends towards the complete form.

The smaller the length of the prolapse the more likely is it to consist simply of mucous membrane, while the greater its length the greater the probability that all the coats of the bowel will be everted; and if the protrusion be of sufficient length, a pouch of the peritoneal cavity will exist between the outer and inner tube in front, or, in extreme cases, the whole way round.

Causes of prolapse.—In the majority of instances the protrusion is indirectly due to causes which induce an exaggeration of the normal ejaculatory functions of the rectum. In addition there are certain predisposing influences, both normal and pathological, which materially aid in allowing these unnatural exciting causes to produce their effect. Thus in young children the rectum has less support than in the adult, due in part to the absence of any well-marked curve in the sacrum and to the natural elasticity of the tissues. Among pathological influences are such as produce a want of tone in the parts, as for instance debility

from any cause. The effect of these constitutional conditions is (1) to produce a weakening of the muscular coat of the bowel, the sphincters, and the slinglike and supporting action of the levator ani, partly as the result of lack of nerve power and partly from wasting of the muscle tissue; (2) to remove the padlike support of the fat in the ischio-rectal fossæ, and to weaken the connective tissues which unite the mucous membrane to the muscular coat.

The causes which bring about undue action of the rectum in children are whooping cough, diarrhœa, intestinal worms, the presence of a rectal polypus, phimosis, stone in the bladder, and the prejudicial habit of allowing a child to sit for too long a time upon the stool after the required movement of the bowels has taken place. It has been noted that prolapse is most frequent at the ages and at the times of the year when diarrhœa is most prevalent.

In the case of adults similar causes may be present, such as rectal polypus and vesical calculus; in addition, however, there are causes peculiar to adult life and advancing age, such as chronic constipation, hæmorrhoids, urethral stricture, and enlarged prostate.

The formation of a prolapse is sometimes sudden, but more frequently it is gradual. When arising suddenly, it is generally traceable to some excessive straining effort. When gradual, the mucous membrane prolapses in the first place, and then, by its constant and increasing dragging effect, it causes the muscular tunic to follow, and a complete eversion is produced.

Symptoms.—It is somewhat difficult, if not strange, to speak of the symptoms of what is in itself practically only a symptom; for, as above shown, the condition is almost invariably the result of some definite cause, which must be successfully dealt with in the first place if the prolapse is to be prevented. However, if the prolapse is secondary to some other trouble, it nevertheless creates obvious troubles and inconveniences directly traceable to its own existence.

The appearance of a prolapse is not likely to be mistaken after careful examination of the part. When the protrusion is only slight, it may resemble the projection of internal hæmorrhoids, or a polypus; but neither of them need mislead if, as stated, the part be carefully examined by the eye and the finger.

A typical protrusion of the gut presents either the appearance of a cylinder or of an inverted cone, with the mucous membrane either smooth or more or less transversely or obliquely plicated. At the apex and in the centre of the cone or cylinder is the orifice of the bowel. When small intestine bulges into the peritoneal pouch on the anterior aspect of the prolapse, it is apt to cause the orifice at the apex of the protrusion to be directed somewhat backwards. The sides of the prolapse slope upwards and become continuous with the skin surrounding the dilated and stretched anal orifice. The appearances of the mucous membrane vary according to the acuteness or chronicity of the case. When only recently extruded, it may be florid in colour, covered with mucus, and prone to bleed; but when the case is of old standing, and especially if the prolapse remains down, the membrane becomes pale in colour and more or less indurated, resembling skin, or, if very tough, not unlike leather. Patches of ulceration are sometimes present.

Most of the symptoms strictly attributable to prolapse of the rectum arise when for some reason the bowel cannot be immediately and easily returned after its descent. The constant dragging effect of the prolapse and the constriction at the anus tend each to produce its own train of symptoms. Thus the anatomical relation of the urethra and the bladder in the male causes this part to be pulled upon by the prolapse, so that pain and difficulty in micturition may result; and in some cases retention of urine is caused. The dragging upon the rectal nerves may also induce distressing pain in the loins and down the thighs. When constriction takes place at the anal orifice, the prolapse becomes strangulated and acute pain immediately follows, with congestion, inflammation, and possibly sloughing of the part. In exceptional instances the prolapse completely sloughs off, and a natural cure results.

In chronic conditions of prolapse there are apt to be frequent attacks of bleeding, while constipation alternates with diarrhœa. In some cases there is fæcal incontinence. The straining also, which is sometimes a constant and aggravating symptom, has in rare instances resulted in rupture of the bowel.

Treatment.—It need hardly be pointed out that, inas much as prolapse of the bowel is in the majority of instances

a symptom, the cause which has given rise to it needs to be treated in the first place. Assuming therefore that the local or constitutional, exciting or predisposing cause has been attended to, the treatment of the prolapse may next be considered.

In *children* the simplest method of treatment for slight cases consists in first placing the child on its abdomen across the mother's knees, the buttocks raised, and the thighs flexed. The prolapse is cleansed, and then besmeared with some vaseline; gentle pressure is applied to the apex of the cone or cylinder with the fingers until it slips up within the anus. The child should afterwards be kept in the recumbent position; a pad and T-bandage applied, or the buttocks held close together by strips of adhesive plaster. All motions should be passed while the child lies on its side; and in order to exercise some restraining effect against the return of the prolapse, one buttock may be drawn aside, so as to put tension on the anal orifice while defecation takes place.

When the prolapse shows a tendency to recur, the patient may be treated with some form of astringent. The free application of nitrate of silver as stick to the whole mucous surface, previously wiped with lint and subsequently mopped, answers well in some cases. Or, the part may be bathed with a solution of sulphate of iron, one grain to the ounce of water. Another method is to use astringent injections after a motion and after the bowel has been returned. For this purpose three or four ounces of water containing three grains of tannic acid to the ounce may be used, or a decoction of oak bark with or without alum.

As further adjuncts towards maintaining the bowel in position, some form of rectal pessary may be used.

Should the case still resist such simple measures, the mucous membrane of the prolapse must be painted over with strong nitric acid, a camel's-hair brush being used for the purpose. Chloroform must be administered, the mucous membrane dried, and care taken not to touch the skin around the anus with the acid. After the application the part is oiled and returned, and the rectum stuffed with some cotton wool. The straining which is liable to follow upon the child's recovering consciousness necessitates the application of a pad and bandage, and the strapping of the

buttocks together. Allingham * orders a mixture of aromatic confection with a drop or two of tincture of opium, in order to confine the bowels for four days. A teaspoonful of castor oil is then given, the strapping pad and bandage removed, and the first motion brings away the woollen stuffing. A single application of the acid is usually sufficient, but occasionally a second and even a third may be required.

In any case where there is difficulty in reducing the prolapse in children, the result of crying and straining on the part of the patient, chloroform should be administered, so as to avoid injuring the bowel by any undue force.

In *adults* the prolapse, if of any magnitude or chronicity, is seldom amenable to such simple measures as in the case of children. In recent cases, however, and in such as consist of the prolapse of mucous membrane only, astringent injections should be tried, or the systematic employment of cold-water enemata, before attempting any more radical means.

When operation becomes necessary, several methods are at present in vogue, all of which have been practised with success; and although their respective merits are regarded with very variable degrees of approval among surgeons, they at least deserve recognition both for the ingenuity which characterises some and the good results that have followed in all.

Among the more conservative measures are the use of the clamp and the cautery; the application of the cautery alone; the excision of an elliptical portion of the mucous membrane; or this in conjunction with the skin.

Severer operations consist in amputation of the part, or in elevation and fixation of the prolapse.

By clamp and cautery.—By this method folds of mucous membrane are clamped in a similar way to that in which hæmorrhoids are secured. The clamped portion is removed either by the thermo-cautère or heated irons; in each case the heat should not be beyond that which produces a dull red colour. The amount to be removed depends upon the nature and extent of the prolapse. Several portions

* "Diseases of the Rectum and Anus," p. 165.

may need to be clamped, and where the anal orifice is very patulous a piece of skin may also be included.

By cautery.—With the iron cautery at a dull red heat, four or more longitudinal stripes are made from the base to the apex of the protruded intestine; care should be taken to avoid the large veins which can be seen on the surface of the bowel. If necessary the anus should be forcibly dilated, and about six inches of a good-sized drainage tube, surrounded with strips of gauze in glycerine and iodoform, introduced, and retained.

The object of the treatment is to lessen the calibre of the canal by the cicatricial contraction which follows upon the healing of the ulcers after the separation of the sloughs; and the formation of inflammatory adhesions between the mucous and the muscular tunics of the rectum.

This operation can also be performed after the prolapse is reduced. In such cases a wire or other suitable speculum is used, which will admit of the iron or cautery being introduced and the mucous membrane seared as above.

By elliptical excisions.—This method has for its object a similar result to that attained by the use of the cautery. Elliptical portions of the mucous membrane are excised in the longitudinal axis of the bowel. Their removal necessitates the healing of the raw gaps by cicatricial tissue, which results in a narrowing of the canal. When, however, there is much dilatation of the anus, something further is needed in the way of narrowing this orifice.

By amputation.—*Method of Mikulicz.**—The patient is placed in the lithotomy position, and the prolapsed bowel properly cleansed and disinfected. The operator then inserts the index finger of the left hand into the prolapse, and cuts through with a knife the external intestinal tube for about two centimetres parallel to the anal margin, and one to two centimetres distant from it. Care is then taken to note that nothing exists between the inner and outer tube. This being observed to be empty, a stitch is then passed so as to unite both tubes; a reef-knot is tied, one end left short and free, while the other is used as a continuous quilted suture through the rest of the circumference of the bowel. As the stitching proceeds and the needle is passed

* Bogdanik, *Archiv für klin. Chir.* 1894, vol. xlviii. p. 847.

through the two tubes, the external tube is cut, so that by the time the prolapse has been stitched completely round, the external tube has been entirely severed. The internal tube is now cut through, and the cut edges of the mucous

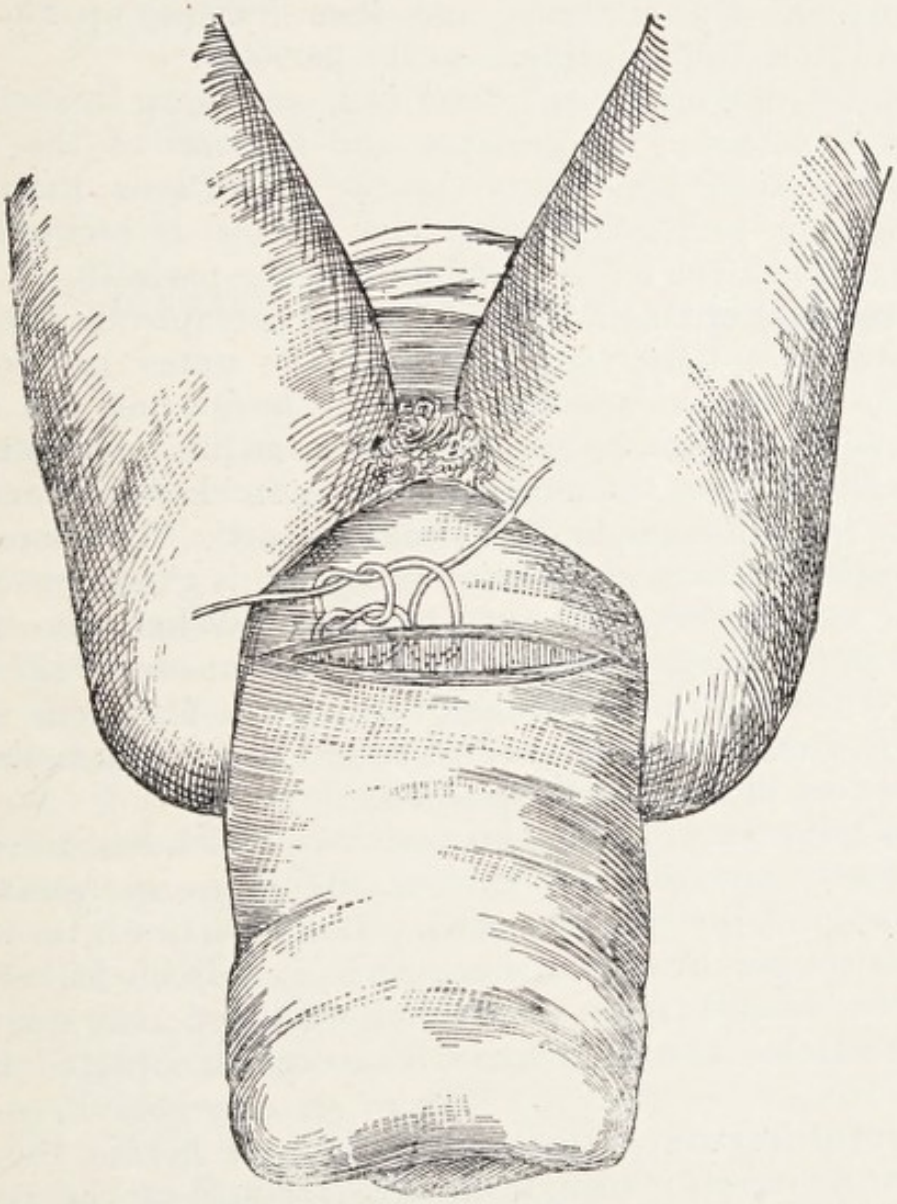


FIG. 86.—MIKULICZ'S OPERATION FOR PROLAPSE OF THE RECTUM. (Bogdanik.)

membrane united by a continuous suture all round. The stump is prevented from slipping within the anus by being held with forceps. There are no vessels to tie, because the process of stitching has effectually secured them before the two tubes are severed. The stump is finally cleaned and allowed to slip back within the anus.

By elevation and fixation.—(A) *By operating through the sacral region.*—The object of this operation is to fix the prolapse through an opening made in the coccygeal region, so that the bowel thus secured cannot descend.

(B) *By preliminary laparotomy.*—This method consists in first opening the abdomen and then *drawing* up the prolapsed bowel and securing it to the parietes.

The two operations just described, consisting in each case of the reduction of the prolapse and fixation of the bowel above by suturing, constitute the operations known as *rectopexy* or *proctopexy* when the rectum is secured, and *colopexy* when the colon is stitched to the parietes.

Intussusception.—Many cases of prolapse are preceded by intussusception; that is to say, the upper part of the rectum becomes invaginated into the lower, and the intussusceptum, continuing to descend, eventually presents at and projects from the anus, producing in the most extreme cases a typical example of procidentia recti. The most distinguishing feature of an intussusception is the sulcus which exists at the base of the prolapse. When the finger examines or traces upwards the mucous surface of the outer tube, it is felt to pass between two layers of mucous lining until it is checked by the reflection of the mucous membrane at the neck of the intussusception.

The symptoms of an intussusception which has descended sufficiently low to project from the anus are practically those of prolapse just described. But when an intussusception exists purely within the rectum, it is liable to be overlooked or mistaken for some other condition; the symptoms may resemble also those of intussusception situated higher up.

Rectal hernia.—In this rare form of hernia the small intestine projects through the anterior wall of the rectum, forming for itself a sac out of the recto-vesical or recto-vaginal pouch of the peritoneum and the expanded tunics of the rectal wall.

Rectocele.—"The condition is one due to an injury sustained in childbirth which becomes exaggerated as a woman passes the menopause, and as the vagina is shortened in after life." This condition, which consists of an undue bulging of the anterior wall of the rectum through the posterior wall of the vagina, is usually discussed more fully

in works upon gynæcology than in those upon general surgery. Its treatment consists in narrowing the posterior vaginal wall, and so lessening the flaccid condition which has most to do with determining the rectal protrusion.

CHAPTER LVIII

MALFORMATIONS. CONGENITAL STRICTURE. DIVERTICULUM.

Pathology.—The various congenital malformations met with are the result of some defect in the normal process of development, which shows itself almost exclusively on the side of deficiency. For a proper comprehension therefore of these aberrations, a knowledge is required of the stages in the development not only of the rectum and anus, but also of the bladder, urethra, vagina, and uterus. It would, however, involve too lengthy a discussion of the subject to introduce this embryological aspect of it; but it may be briefly indicated that the rectum and anal portions of the bowel develop separately, and only become continuous by the later disappearance of the septum which interposes between the two culs-de-sac; and that at an early period of fœtal life, the lower end of the rectum and the genito-urinary tract constitute a common cavity, which later becomes divided into its normal channels by the growth of septa.

In order to simplify the description of the commoner forms of malformation met with, and to present them in a more impressive shape, I have made a series of diagrams, which must, however, be taken as indicating general types rather than exact pictures of what may be found in the class of cases which they are intended to illustrate.

These diagrams may therefore be taken to represent the usual classification of malformations now adopted.

I. The simplest malformation is that of atresia of the anus (Fig. 88). The rectum is fully developed, and also the

anal cul-de-sac, but the orifice of the anus itself is occluded by a membrane.

II. In addition to the anal occlusion, there is also

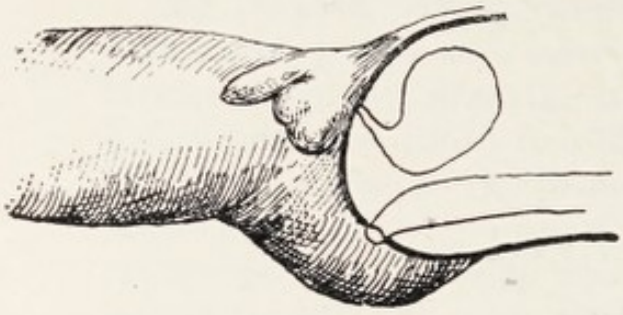


FIG. 87.—NORMAL RECTUM.

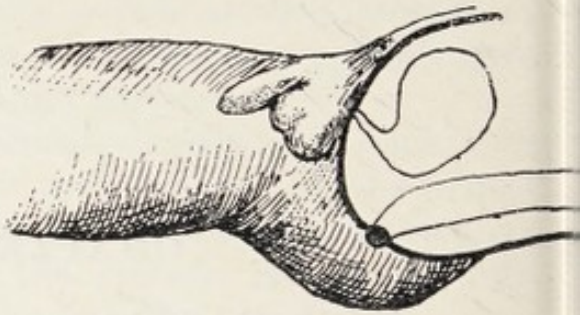


FIG. 88.—ATRESIA ANI.

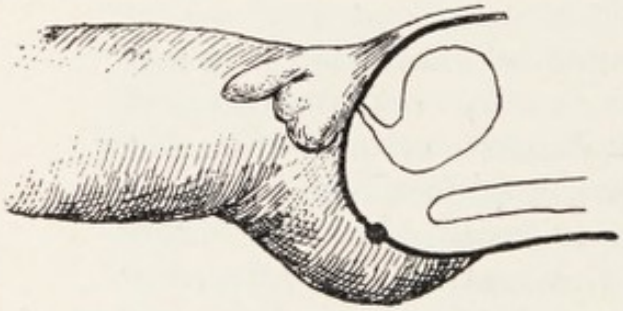


FIG. 89.—ATRESIA ANI WITH PARTIAL ABSENCE OF RECTUM.

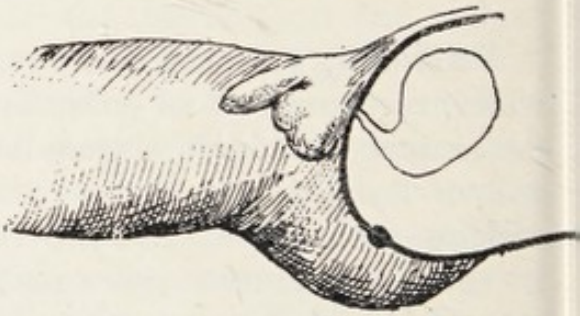


FIG. 90.—ATRESIA ANI WITH COMPLETE ABSENCE OF RECTUM.

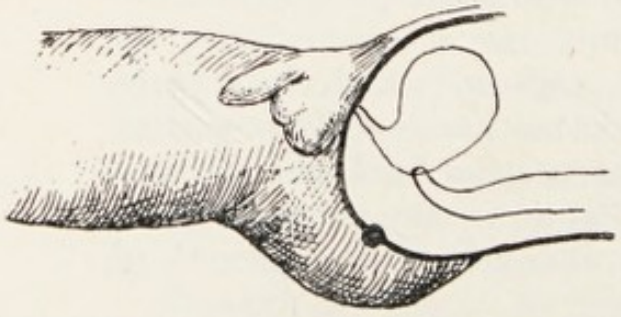


FIG. 91.—ATRESIA ANI WITH FISTULOUS COMMUNICATION WITH THE BLADDER.

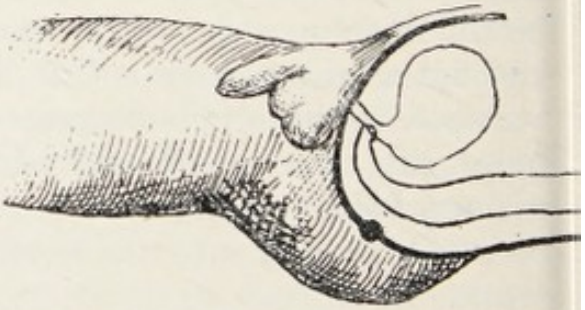


FIG. 92.—ATRESIA ANI WITH FISTULOUS COMMUNICATION WITH THE URETHRA.

FIGS. 87–92.—DIAGRAMMATIC REPRESENTATION OF MALFORMATIONS OF THE ANUS AND RECTUM.

absence of the anal cul-de-sac (Fig. 89). To this may be added more or less deficiency in the development of the rectum, amounting in some cases to complete absence (Fig. 90)

III. There is neither anus nor an anal cul-de-sac, and the rectum terminates by a fistula of variable dimensions as to length and capacity, opening either into the bladder (Fig. 91), or into the urethra (Fig. 92), or into the vagina

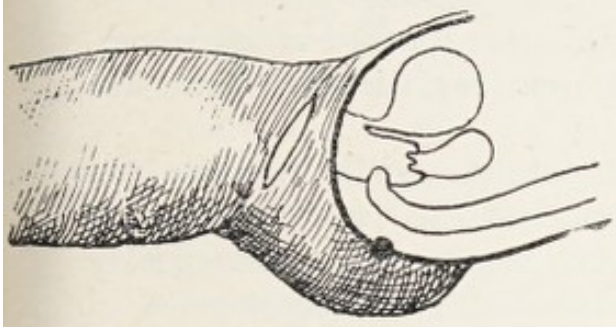


FIG. 93.—ATRESIA ANI WITH FISTULOUS COMMUNICATION WITH THE VAGINA.

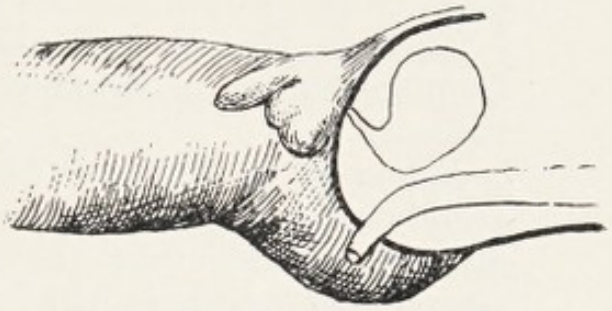


FIG. 94.—ATRESIA ANI WITH FISTULOUS COMMUNICATION WITH THE EXTERIOR, EITHER IN FRONT, BEHIND, OR AT THE SIDE OF THE NORMAL POSITION.

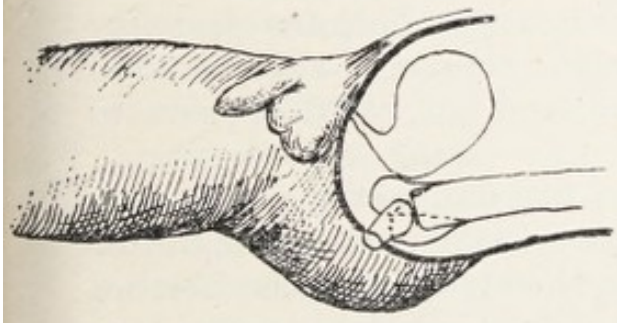


FIG. 95.—ANAL CUL-DE-SAC WITH MEMBRANOUS PARTITION.

The rectal cul-de-sac may lie to one side of the anal.

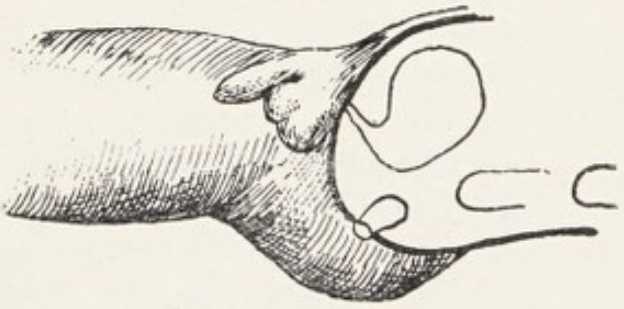


FIG. 96.—ANAL CUL-DE-SAC WITH ABSENCE OF RECTUM, EITHER PARTIAL OR COMPLETE.

FIGS. 93-96.—DIAGRAMMATIC REPRESENTATION OF MALFORMATIONS OF THE ANUS AND RECTUM.

(Fig. 93), or into some part of the perineum, scrotum, or buttocks (Fig. 94) by one or more openings.

IV. Both rectal and anal portions of the canal may be perfectly developed, but the septum which separates the two remains intact. Several varieties of this may exist. If the normal axes of the two segments are maintained, the septum exists as a transversely disposed membrane between the apex of the one and the termination of the other. But

the two culs de-sac may occupy a position of lateral apposition, the rectal lying in front, behind, or on one side of the anal (Fig. 95).

V. The anal portion may be perfectly developed, but there may exist partial or complete absence of the rectum (Fig. 96).

To these five classes must be added other cases of infrequent and rare occurrence which from time to time are recorded.

When an interval of some extent exists between the rectal cul-de-sac and the anus or the anal cul-de-sac, it is always probable that the rectal segment is completely surrounded by peritoneum. This fact is of importance in considering the question of operation, and will be referred to again.

Symptoms.—In those cases where there is no outlet for the meconium, the discovery is soon made by the mother or the nurse, either that there is visibly something defective with the child's anus, or that while the parts appear normal it passes nothing, refuses to take nourishment, and probably vomits what it does take. In the course of a day or two the abdomen commences to swell, and the child appears to be ill.

The existence of a fistulous communication with any part of the genito-urinary system soon becomes manifest by the passage of the meconium through either the urethra or the vagina. In the case of fistulæ elsewhere, the true nature of the case is soon detected. To what extent other symptoms may arise, irrespective of the abnormal discharge, will depend upon the calibre of the fistula. Should this be narrow enough to act as a source of obstruction, vomiting and abdominal distension may soon appear. On the other hand, should the passage be free enough, little trouble need be anticipated so long as the meconium remains thin and fluid. As, however, the meconium becomes more truly fæcal and the fæces assume a solid consistency, urinary troubles rapidly arise in those cases where the communication exists between the rectum and the bladder or urethra.

Diagnosis.—As a rule very little difficulty is experienced in detecting the general nature of the case, although the exact form of malformation present may not

be so easily determined. The cases likely to mislead are those where an anal cul-de-sac exists, and where the early symptoms are not severe.

The simple statement that the child has not passed meconium, although the other symptoms may be slight, and even absent, should be a sufficient indication for the practitioner to make a careful and systematic examination of the rectum either with the finger or by the introduction of a catheter.

In many of these cases there is evidence of some lack of development of the pelvis, so that it appears small when compared with other parts of the body; and the tuber ischii are observed to be abnormally close together. Such defects, or rather deficiency in the growth of the pelvis, indicate a like deficiency in the development of the intra-pelvic viscera; hence, when this condition is at all marked, it may be taken as indicating partial or complete absence of the rectum.

The cases difficult to diagnose are those where the rectal cul-de-sac ends at the same distance above the apex of the anal cul-de-sac or the occluded anus. In these it is not possible to feel any bulging or impulse in applying the fingers to the parts below when the child cries, or when pressure is made by the hand upon the abdomen. On the other hand the conveyance of such impressions is significant of a thin septum between the contents of the bowel above and the exterior. In the case of females some information may be obtained by digital examination of the vagina.

Prognosis.—In considering the future of these cases it is necessary in the first place to deal with them independently of treatment; and in the second, with the prospects held out by operation.

It need hardly be said that no hope exists in those cases where there is complete obstruction. The prognosis in regard to fistulous communications is not so hopelessly bad. Not a few cases are on record where patients born with this type of malformation have lived for years. Much depends upon the situation of the fistula, and the readiness with which the fæces make their exit through it. When the communication is with the bladder or the urethra, cystitis is sooner or later set up, and the child dies of this or of obstruction.

The cases in which prognosis is most favourable are those where the communication is between the rectum and the vagina. It usually happens that the orifice of the fistula is situated near the vaginal entrance. If the orifice and the fistula are of sufficient size to allow of a ready escape of the fæces, the child may live for years, and even reach old age, with nothing more to complain of than the inconvenience associated with the abnormal fæcal outlet.

In most cases where symptoms of obstruction set in, death results from exhaustion; there is, however, the possibility of the distended bowel rupturing.

Prognosis in regard to operation.—It naturally follows that the simpler the operation requisite to deal efficiently with the malformation, the more likely is treatment to be successful. Thus it is found that the best results follow the treatment of vaginal fistula, and simple incision into a bulging rectal cul-de-sac, while the worst are those in which an artificial anus is made either in the inguinal region or in the loin. Although operation may have succeeded for the time being in reopening up the normal channel, there is a perpetual tendency for it to close by the formation of a very tight and intractable stricture.

Treatment.—Clinically these malformations present themselves under two distinct classes—those where the nature of the abnormality is evident, and those where it is not. In discussing, therefore, the treatment, it is right to consider it from the twofold aspect; for while it serves admirably the purpose of the pathologist to classify the various malformations which may be found, it is not of much practical service to the surgeon, who in many cases is forced to perform his operation before discovering the nature of the deformity for which he does it.

When a distinct bulging exists or an impulse is distinctly felt at the seat of an occluded anus, or at the apex of an anal cul-de-sac, the surgeon has little difficulty in deciding that the proper course to pursue is to make a small crucial or single incision into the projecting mass and allow the escape of the pent-up meconium. Later, if considered necessary, the opening thus made may be dilated to the required extent.

When meconium is passed by some abnormal channel, the treatment will be determined by the troubles caused.

Thus, if it is possible to dilate the fistula sufficiently to allow of a free and unobstructed exit of the meconium, no immediate danger need be anticipated ; but if such dilatation is not possible, and obstruction, if not present, certain to appear sooner or later, then an operation which otherwise might with advantage have been delayed must be performed.

If the meconium passes through the urethra the rectal communication is either with this canal or with the bladder. A dissection should be made in the median line of the perineum. If the fistula is recto-urethral it will be reached and found possible to disconnect it. The bowel should then be brought down and fixed in the perineum. Should the result of the dissection prove negative, it is then probable that the fistula is recto-vesical, and nothing but a sigmoid anus will give the requisite relief.

If the meconium come through the vulva, a vaginal fistula is present. Regarding the treatment of this condition some difference of opinion exists. If a well-marked sphincter guards the orifice of the vaginal anus, it may be well to leave the case alone rather than run the risk of losing, by dissection and transplantation, this power of control. If operation is attempted the most successful appears to be that devised and carried out by Rizzoli. Its main object is to dissect back the rectum, and preserve the tissues around the vaginal orifice which may act as a sphincter. The operation is commenced by an incision carried from the lower margin of the vaginal anus backwards towards the coccyx. The rectum is then detached, care being taken not to open the bowel, and the vaginal orifice stitched into the place where the normal anus should be situated. Deep sutures are inserted to close in the posterior part of the vaginal wall, and so form a recto-vaginal septum.

If there is no immediate urgency these plastic operations (proctoplasty) may with advantage be left until the child is older and therefore better fitted for operation.

When external fistulæ exist either in the perineum or scrotum, there may not be need for immediate interference. It must be remembered that in so young a class of patients all delay is valuable with a view to the safety and success of any operation, as long as it does not entail a less suitable

state of the child's general condition. If on the other hand the nature of the malformation involves increasing gravity in the condition of the child, the sooner operation is performed the better. Should the fistulæ in this class of cases not suffice to allow of a free discharge, they should be either enlarged or a perineal dissection made to obtain the more dilated portion of the bowel.

What treatment is to be adopted when the surgeon has no distinct guidance as to the type of the malformation present? To very many cases which present themselves for treatment this question is applicable.

The usually accepted course to pursue is to make an incision backwards from the normal seat of the anus to the coccyx, removing this if thought necessary, and continuing to extend the incision deeply and in the direction of the concavity of the sacrum. If a reasonable dissection of this nature fails to reach the bowel, there is nothing for it but to make an artificial anus either in the groin or in the loin. If on the other hand the rectal cul-de-sac is reached, an endeavour should be made to bring the rectal outlet to the surface and stitch it there. In cases where this involves much tension on the bowel, the coccyx may be removed, and so the distance to the surface shortened. While an incision into the bowel will for the time relieve the child, it soon becomes little more than a troublesome fæcal fistula; hence the advantage attached to fixation of the rectal orifice to the skin surface.

As regards searching for the bowel by dissection in the perineum, it should be remembered that in cases where there is deficiency of development of the pelvis as a whole, there is the greater probability that the rectum may be entirely absent or occupying a high limit.

When it is decided to open the bowel, should a colostomy be performed or an artificial anus made? From my own experience I am disposed to favour the formation of an artificial anus, and for this reason, that the bowel of an infant is so thin, and more particularly so if it has been distended, that it is difficult to stitch it accurately to the parietal wound; and if, as is usually the case, it must be opened at once, the thin meconium is liable to contaminate the surface of the bowel and find its way into the peritoneal cavity. If on the other hand a loop of intestine is with-

drawn and secured by a rod of some kind passed transversely through the mesentery, and a drainage tube fixed into the upper end of the loop in such a way that the meconium can only escape through it, there is little or no danger of septic infection. It has also the further great advantage that a much shorter time is required to make an anus than to make a fistula such as results from a colostomy. The only objection which the method has is the difficulty of closing the anus as compared with the fistula, if such be required. It is more than likely, however, that if it is possible for the patient to live for any length of time, he will do so better with a good artificial anus than with one which has been subsequently opened up in the perineum, and which shows a constant tendency to contract and close.

It is usual to operate in the left groin with the object of opening the sigmoid flexure. In these cases of defective development, however, it not infrequently happens that the sigmoid does not lie in its normal position. If therefore this part of the bowel cannot be found, the surgeon must either secure any distended loop which presents, or else close the original wound and open in the right groin.

The question is often raised whether, after the bowel is opened in the groin, any attempt should at once be made to open up the perineal passage by a bougie or director passed in and downwards through the bowel orifice. Such treatment has been adopted and with success. Possibly such a course is right when the infant's condition admits of the prolongation of the operation, and when it is felt that the apex of the bougie is at no great distance from the normal seat of the anus or the anal cul-de-sac. But for this latter condition there is the danger that the rectal cul-de-sac may be surrounded by peritoneum, and so its perforation lead to a communication with the general peritoneal cavity. The one advantage of attempting this method of establishing a normal channel at the first operation rather than delaying it for future treatment, is the ease with which it is possible to close up the opening in the colon. The difficulty later would not exist so much with a colostomy; but with an artificial anus an operation entailing considerable risk would have to be added to what so far may have proved successful.

Nothing has as yet been said of the treatment of many

of these cases by puncture or the use of the trocar and canula. The practice was much in vogue many years ago, but experience has sufficiently shown that it is one of the most dangerous methods to employ. The fatality in connection with it is largely dependent upon the fact that there is nothing to guide the operator in avoiding the injury which he is liable to inflict. The trocar may be passed directly into the peritoneal cavity, or traverse the rectal cul-de-sac and then enter the peritoneal cavity.

Congenital stricture.—The term "congenital stricture" implies not necessarily that a stricture existed at birth, only that the conditions involving its subsequent development were present. These cases are usually included under those just described, inasmuch as they are the result either of defective development of the anal or lower rectal portion of the canal, or of treatment employed in remedying some of the more serious obstructive malformations. When arising as the result of incomplete development, the stricture takes the form either of a canal which has remained too narrow for the purposes required; or the septum which normally divides the anal and rectal portions of the gut has only been imperfectly removed, so that either a simple orifice exists in it, or a part remains in the form of a valve. The stricture may escape notice for many years; and not until age lessens the general elasticity of the tissues, and the fæces become larger and more solid, do symptoms of obstruction and difficulty in defecation arise. These symptoms differ in no respect from those already described as arising from innocent or non-malignant stenosis; abscess and fistulæ may result; or ulceration and fæcal extravasation may lead to periproctitis.

Strictures which arise as the result of operations performed to open up the continuity of the canal in cases of imperforate anus or rectum, or as a result of transplanting the rectum from the vagina or the urethra to the perineum, are often among the most troublesome. They are essentially cicatricial strictures and therefore extremely tight. The simplest form arising from operation is such as may be met with after incision for atresia ani.

Little need be said regarding the treatment of these cases; for if simple dilatation or incision of the stricture is not sufficient, it must be treated on the lines already laid

down for stricture arising from other non-malignant causes (see page 440).

Diverticulum.—True diverticula of the rectum are extremely rare. Only a few instances are recorded. They become distended, and in that condition cause obstructive troubles, and produce either visible or tangible swellings. In one case the finger could be made to enter the diverticulum through a constricted neck. It was successfully excised.

CHAPTER LIX.

NEUROSES. EXTERNAL INFLUENCES.

Neuroses.—While much has been written upon the subject of neurotic affections of the rectum, most men appear practically to have seen but little of them. Judging from the literature on the subject, the object of many writers appears to be to refute rather than to support the theory that such affections exist. No doubt in many instances patients have been led to believe, either through their own aberrant nervous condition or as the result of ignorant and groundless suggestion, that rectal trouble existed, and have been treated accordingly. Indeed, many years ago, supposed strictures of the rectum seemed a sort of fashionable complaint, for which the systematic passage of bougies was considered the proper treatment.

In addition to these imaginative cases, there is little doubt that a great many cases of so-called neuralgia of the rectum have their explanation in the existence of some organic lesion. Either the pain is set up by a small ulcer or abrasion, in the floor of which a sensitive nerve filament is exposed; or the pain is excited reflexly by disease situated in some neighbouring organ or tissue. If a case is to be considered one of true neuralgia, a careful examination should reveal no lesion to account for the pain, nor should the patient's sufferings be in any way affected by defecation.

The class of patients supposed to be the subject of these neurotic affections are usually females of feeble constitution and of a more or less depressed state of the nervous system. The pains attending them are described as often excessively acute and lancinating, and sometimes periodical in their mode of seizure.

In treating the condition attention should be devoted to the general health, and such remedies and directions given as would be considered expedient and suitable in patients that possess in all probability an irritable and neurotic temperament. While some cases improve rapidly under treatment, others appear intractable, the attacks of pain recurring from time to time.

External influences.—The rectum, like all other parts of the intestinal canal, is liable to be pressed upon, displaced, distorted, or opened into by agencies acting from without and primarily unconnected with the bowel.

Pressure may result from an enlarged prostate, or from an abscess connected with the prostate; from tumours growing from the uterus, ovary, bladder, or sacrum. Displacement or distortion may be due to similar causes, or to inflammatory action, as seen in pelvic cellulitis. Abscesses, both acute and chronic, may burst into the rectum, giving rise to the discharge of pus and blood, more or less continuous according to the nature of the primary disease. Ovarian cysts also occasionally communicate with the rectum and produce a discharging fistula. Chronic abscesses are such as arise from caries of the bones of the pelvis; from caries of the spine producing a psoas abscess; and from abscess in connection with hip-joint disease. Acute abscesses may be the result of pelvic cellulitis, pelvic appendicitis, prostatic abscess from gonorrhœa, &c.

When rectal troubles arise in connection with pelvic cellulitis, the inflammation leads either to the formation of an acute abscess, or to a more chronic process involving much inflammatory thickening and contraction. In the former case the abscess may burst into the bowel, and produce for the time no more serious rectal symptoms than the discharge of a quantity of blood and pus, which ceases as the abscess cavity closes and heals. In the latter case, however, the greater slowness of the process may result in the formation of adhesions and fibrous bands,

which compress, drag upon, or displace the bowel from its usual position, and lessen its normal function as a more or less uniformly distensible canal. The sequel to these influences is in some cases a well-marked fibrous stricture; for while the cause is at first situated external to the bowel, its parietes soon become directly involved, and changes take place in it which lead to a condition indistinguishable from any arising primarily within the gut wall.

Abscess arising in connection with the prostate may be either of an acute or chronic character. When acute it is frequently the result of gonorrhœa, and causes not only difficult but painful defecation. The urethra is also liable to be pressed upon, so that urinary trouble is often associated with the rectal.

Tumours of the bladder capable of producing obstruction are rare, but cases have been recorded.

CHAPTER LX.

OPERATIONS.

1. THE ADMINISTRATION OF COPIOUS FLUID ENEMATA.
2. THE PASSAGE OF BOUGIES, &C.
3. INTERNAL PROCTOTOMY.
4. EXTERNAL (LINEAR OR POSTERIOR) PROCTOTOMY.
5. PROCTECTOMY—
   a, PERINEAL; *b*, SACRAL OR POSTERIOR; *c*, VAGINAL.
6. PROCTORRHAPHY.
7. PROCTOPEXY.
8. PROCTOPLASTY.
9. RECTAL ELECTROLYSIS.
10. RECTAL CAUTERISATION.

1. **The administration of copious fluid enemata.**—The object in view may be (1) to excite peristaltic action

in the intestines, (2) to empty and clease the lower bowel, (3) for purposes of diagnosis. When it is merely desired to excite the bowels to act, the fluid will be best injected by means of a Higginson's syringe, with the patient in the sitting posture over the stool. The sudden and forcible injection of, say, warm soap and water soon evokes a desire to empty the bowel.

If the object is both to empty and cleanse the rectum preliminary to operation, the enema is best administered while the patient is lying on the back with the buttocks slightly raised and resting upon the bed pan. A gum elastic urethral catheter of No. 10 or 12 size, lubricated with vaseline, and having attached to its free end a rubber tube about three feet in length, is inserted into the anus, and made to pass as far as possible up the rectum. To the other end of the tube is fixed a filler or funnel. This is held up about two feet above the bed and the fluid allowed to flow in slowly. The object in view is not to excite peristaltic action before the bowel has been well distended, and its mucous folds put more or less on the stretch. By so stretching the part it is much more efficiently cleansed, and any fæcal particles which may be lodged in folds or small recesses, or be unduly adherent to the lining membrane, will be detached and ejected with the outflowing fluid.

When injecting fluid into the rectum for diagnostic purposes, the same precautions should be exercised in not introducing it too quickly or too forcibly. The object may be to ascertain the locality of a stricture either high up in the rectum, or in the colon; to excite peristaltic action too readily or too soon would be to frustrate the object for which the injection was being given.

2. **The passage of bougies, &c.**—A bougie is introduced into the rectum either for diagnostic purposes or for treatment. When with the former object, a large-size one is introduced, in order to detect in the first place whether there is any real obstruction.

For the passage of a bougie any one of the three positions for making a rectal examination may be employed, the lateral, lithotomy, or knee-elbow position. The lateral will frequently prove the most convenient. The patient lies on the left side with one or both knees drawn up. Preferably

the rectum should be first emptied by a copious fluid enema. A little oil containing opium or belladonna is injected, to facilitate the passage of the bougie, and to allay any irritability of the rectum. To further ease the introduction of the bougie it should be besmeared with seme tenacious lubricant such as vaseline and boracic acid, or Unguentum Hydrargyri. No force should be employed, and if any obstruction is met with the bougie should be withdrawn somewhat, and its direction slightly altered. Independently of any pathological obstruction it should be remembered that the bougie may catch in one of the folds of the rectum, or impinge upon the promontory of the sacrum, or be caught in the cul-de-sac of an intussusception.

Injuries effected by the introduction of a bougie have already been indicated (see page 458).

For the kinds of bougies in use, and the cases best suited for their respective application, see page 438.

For the method of introducing the hand into the rectum, see page 416.

3. **Internal proctotomy** resembles in all respects internal œsophagotomy and is employed as an operation for the same conditions.

The strictures best suited for the operation are those nearer the anal extremity of the gut.

The bowel is previously cleansed as well as the condition will permit. An anæsthetic is administered and the patient placed in the lithotomy position. The anus is forcibly dilated and the lower end of the stricture exposed by a speculum. A probe-pointed straight bistoury is then passed through the stricture, guided either by what is seen through the speculum or by the introduction of the forefinger of the left hand. The knife is then made to cut through the stricture sufficiently deeply to reach the healthy tissues beneath. In some cases the one incision will be sufficient, in others two or more will be required. A good-sized rubber tube about six inches in length, and surrounded with strips of gauze soaked in glycerine and iodoform, should be inserted after the incisions, and retained as long as possible.

One of the alleged objections to this operation is the difficulty of incising the stricture with such nicety that while the incisions completely divide the cicatricial tissue they do not enter too deeply into the healthy tissues

beneath. Should these healthy tissues be incised too freely, there is the danger of septic infection of the wound, with consequent proctitis or periproctitis.

An essential feature of the operation is the maintenance of dilatation. Unless tubes are constantly worn or introduced for a prolonged period from time to time, recontraction will take place, and a renewal of all the old troubles follow.

4. **External proctotomy.**—This operation is sometimes spoken of as linear or posterior proctotomy, and is employed for opening the rectum for the removal of impacted foreign bodies, tumours, or for the division of strictures, innocent or malignant. It consists in laying open the bowel completely from and including the anus, upwards and backwards towards the coccyx.

The patient is placed in the lithotomy position, and the tissues divided posteriorly.

In operating for stricture two methods of using the knife may be employed. In the first the anus and the part of the rectum and tissues behind and below the stricture are cut through with an ordinary scalpel. The lowest part of the stricture is thus fully exposed, and its complete division is then proceeded with. In the second method either a sharp-pointed curved bistoury is guided *through* the stricture, and the whole tissues cut in the medial line posteriorly; or an ordinary scalpel is used and the same structures divided from without.

In order to check the hæmorrhage which may follow, the wound should be tightly packed, the stuffing being removed daily by degrees. The advantage of this operation is the complete drainage which it affords, and hence the little likelihood of those inflammatory complications which sometimes arise when, in the case of stricture, the incisions are carried out wholly within the bowel.

5. **Proctectomy.**—The operation implies partial or complete removal of the rectum for ulceration, stricture, or cancer. It is performed either from below through the perineum (*a*, perineal), or from behind (*b*, sacral or posterior), or through the vagina (*c*, vaginal).

Whichever of these three operations is performed, certain preparations of the patient and of the rectum are requisite before commencing to excise the part. The bowels should be well cleared out by the administration of a good

dose of castor oil administered two days before the operation. A second dose should be administered the morning before, and upon the morning of the operation copious enemata of dilute Condy's fluid should be used.

Where, from the tightness of the stricture, or from the obstructiveness of the growth, it is found impossible to get the bowel well emptied above the seat of disease, an artificial anus should be made in the groin. This preliminary measure is most advantageous when the operation is to be by the sacral method, and is by some advocated in all cases as preparatory for it. It is usual to make the anus in the left groin, but if the meso-sigmoid is short, and the amputation likely to be a high one, the first opening should be closed, and a colonic anus made in the right groin. By so doing there will be less difficulty in pulling down the requisite amount of bowel for fixation either in the sacral or perineal regions.

(*a*) **Perineal protectomy.**—The term perineal is not particularly apt, as the operation is not strictly through the perineum, but mostly posterior to it. The term serves, however, to distinguish it from the other two regions from which the gut may be approached.

The patient is placed in the lithotomy position. A sharp-pointed curved bistoury is introduced at the anus, guided by the index finger of the left hand. The point is made to transfix the bowel posteriorly opposite the apex of the coccyx; it is then made to cut its way outwards, keeping strictly to the middle line. The lower part of the bowel is thus completely laid open. After securing any bleeding points, the edges of the wound are each transfixed by a piece of silk of sufficient length to admit of their being held firmly apart while the next stage of the operation is proceeded with.

The next step in the operation is to commence a separation of the lower end of the rectum. If the anus is to be preserved, then an incision is carried round the bowel at the junction of the mucous membrane and the skin; if not, then a circular incision is made through the skin just external to the anus, and the external sphincter therefore removed. After this incision the finger will best aid in detaching the bowel. In order to free it more readily, and also for manipulative purposes, the lowest part of the bowel

should be secured by ring vulsellum forceps, or preferably by a stout silk thread. Grasping either of these with the left hand, the operator can pull the rectum to one or the other side, backwards or forwards, and so very materially facilitate its detachment either by the fingers, blunt instruments, or the scissors, from the neighbouring parts. Care must be taken when separating in front not to injure or open the vagina in the female, or similarly the urethra and the prostate in the male. The introduction of a catheter into the bladder will serve to indicate the position of the urethra.

When the upper limit of the diseased part is reached the bowel is severed. This may be effected either by the écraseur, the cautery, or the scissors. Hæmorrhage occurring during the operation should be checked by the application of forci-pressure forceps, or small pressure pads.

There is little use in attempting to bring the mucous membrane above down to the skin and stitching it there, if in so doing there is much drag upon the stitches, as the tension will invariably cause the sutures soon to cut through. The part should, therefore, be freely irrigated, dried, and dusted with iodoform. A large-sized rubber tube should be passed into the bowel, and the parts around packed with iodoform gauze. Opium should be freely administered, in order to bind the bowels for several days. Later, dilatation will have to be kept up by the continuous use of bougies.

In the course of a day or two, the stuffing should be removed, and fresh introduced. If, however, there has been any leakage of fæces, or the wound in any other way appears septic, the wound should not be restuffed, but irrigated with some antiseptic solution three times a day, or, better still, the patient should be induced to sit for a short time in a hot sitz-bath.

6. **Posterior protectomy.**—The object of this operation is to remove disease situated too high up to be dealt with by the perineal method.

The operation will be best considered by treating it in three stages:—(1) The exposure of the bowel; (2) its removal; (3) the securing of the upper segment after amputation.

(1) *The exposure of the bowel.*—The best position of the patient is the ventral one, with the pelvis raised, and the legs dependent over the end of the table, the limbs being so secured and supported as not to drag upon the trunk. The position is practically that usually adopted for the anatomical dissection of the perineum.

The skin incision, from four to six inches in length,

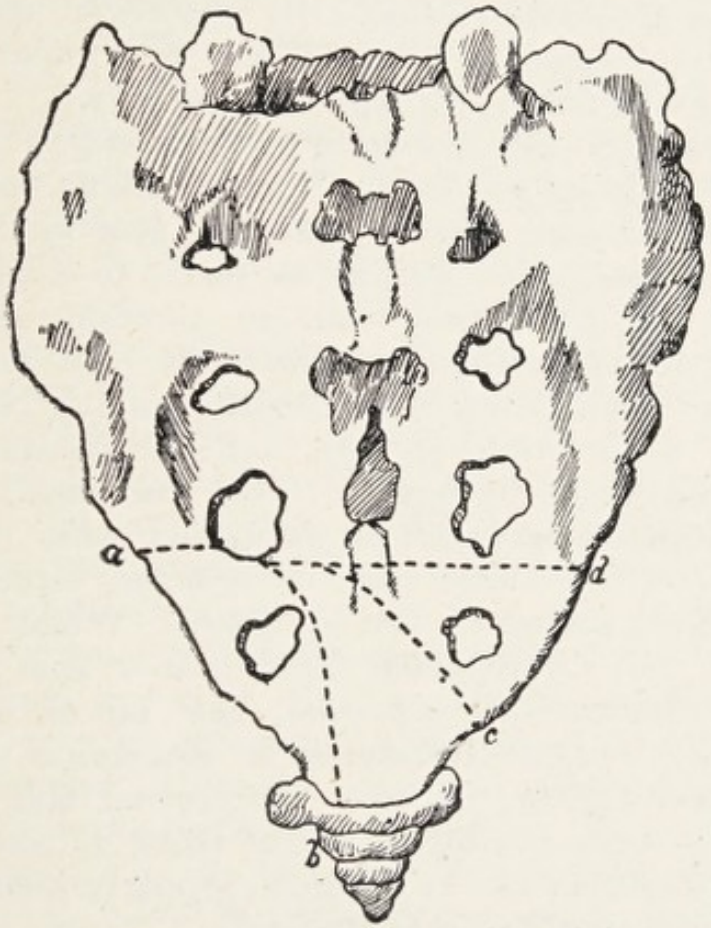


FIG. 97.—SHOWING THE AMOUNT OF BONE REMOVED BY DIFFERENT OPERATORS.

ab, Kraske ; *ac*, Hochenegg ; *ad*, Kraske for extreme cases. (Hochenegg.)

reaches from about the middle of the sacrum towards the anus, and is carried down to the bone.

The further steps of the operation depend upon the extent of the disease and the amount, therefore, of the bowel to be removed. Thus the removal of the coccyx only may afford sufficient room ; if not, the sacro-sciatic ligaments may be detached ; and if still the space is not ample enough, portions of the sacrum can be removed,

chiselling off the required amount of bone to as high as the third sacral foramen. When bone has to be removed care should be taken, in the first place, to detach the soft tissues from the anterior surface of the coccyx and sacrum, and as the separation of tissues is proceeded with all bleeding points should be at once secured. It is at this stage of the operation, when hæmorrhage is liable to be profuse, that the services of a good assistant are invaluable.

(2) *Removal of the rectum.*—By whatever method the bowel is approached or exposed, the next point for consideration is the removal of the diseased part.

The freeing of the gut from its connection should be either with the finger or with some blunt instrument, and where divisions are needed the scissors should be used. A special effort should be made to keep as close as possible to the bowel wall, so avoiding any undue laceration of the soft parts around the gut and in the ischio-rectal fossæ. Bleeding points should be at once caught up with catch forceps, and all parenchymatous oozing checked by stuffing. If the peritoneal cavity is opened, it should be carefully protected while the bowel is removed. This latter may be effected either by the scissors, the cautery, or the écraseur. When it is impossible to tell by external examination the height to which the disease has extended, the bowel should be opened and the finger introduced to determine the proper point for making the division. To prevent the possibility of the upper segment slipping out of reach in cases of high amputation, care should be taken to properly secure it with forceps before severance is completed.

After the bowel has been excised the wound should be carefully cleansed, and then the opening in the peritoneal cavity sought for. Although but little harm has in many cases followed leaving the peritoneal opening untouched, the general opinion is that if closure is possible it should be effected.

The next step in the operation is to bring the gut down, and here I quote from the directions which are well expressed by Gerster*: "Where high amputation is to be performed, the surgeon must try sedulously to preserve

* *Annals of Surgery*, 1895, vol. xxii. p 494.

the nutrient vessels of the mesentery, otherwise the entire rectal stump may mortify. This will be found most difficult in that part of the rectum which adjoins the flexure. Lateral incisions through the peritoneal attachments are permissible, but cutting into the mesenteric line itself will certainly be followed by disaster. Adequate lateral incisions will permit the surgeon to peel up the gut from the sacrum by the gentle use of the finger-tip. The higher this detachment of the gut is carried up, the less tension will have to be encountered in drawing down and attaching the stump to the upper angle of the external incision, especially where portions of the sacrum have been removed. A few stout silk sutures passed through the entire thickness of the gut laterally will serve amply to anchor the gut to the skin, the rest of the wound remaining open."

(3) *The securing of the upper segment after amputation.*—The ideal result is obtained when it is possible to retain normal control through the external sphincter. Retention of the external sphincter is, of course, only possible in cases where the anal portion of the gut is not implicated; and, further, its future use as a sphincter is only possible when the upper segment can be brought down, without tension, to be attached to the anal portion.

Where such union of the two divided segments seems feasible, it may be attempted by one of two methods—either by circular suture, or by some mechanical means, as by Murphy's button or a bone bobbin.

If no attempt is to be made to obtain any sphincter action, then the bowel must be either left in position with the introduction of a tube from the lowest part of the wound into it, or it must be secured to the skin of the wound at such a point as allows of little or no tension; in other words, a sacral anus must be formed. In either of these methods the wound cavity must be loosely stuffed with iodoform gauze and left freely open.

After treatment.—It is advisable to keep the bowels confined for a few days, by the administration of opium, and a milk diet. When the metal button is used, it is advised by Murphy that an early and free use of laxatives be employed, so that the button may not become dammed up with solid fæces.

When a wound has been stuffed, the tissue should be removed after forty-eight hours, and earlier if there is any fear of fæcal leakage or any symptoms of sepsis. It may be restuffed, or freely and frequently irrigated, according to circumstances.

When once the wound is freely granulating, and there is no indication of inflammation, the patient may be allowed to rise and sit, or even walk. The earlier this freedom can be permitted the better.

In cases of sacral anus, Hochenegg* has devised a pad which is secured by a hinge to a belly-band. It is kept firmly applied to the orifice by a strap passing from the front down between the legs, across the perineum, and up behind.

Various modifications have from time to time been introduced in the operation as above described. The objects aimed at have been—to retain a proper support to the bowel and the pelvic contents; to avoid any injury to the nerves supplying the bladder and the lavator ani; to avoid interference with the blood supply of the lower part of the bowel; to lessen the hæmorrhage; and to obtain for the patient some control over the contents of the bowel.

The attempt to retain the normal osteo-ligamentous support to the floor of the pelvis led to the introduction of the formation of osteo-integumental flaps—that is to say, flaps composed of bone and the superimposed soft tissues, which, after being temporarily turned aside for the excision of the diseased part, are replaced and secured in their original position.

Associated with this and other methods of operating are the names of many German surgeons—Heineke, Kocher, Levy, Hegar, Rehn, Rydygier, Borelius, Lange, Willems, Witzel, Gersung, and others.†

Vaginal protectomy.—The mode of operating is thus briefly described by Rehn.‡ The rectum is tamponed, and

* *Boston Med. and Surg. Journ.* 1891, vol. cxxiv. p. 456.

† For a description of these various methods and other considerations in connection with the operation of Posterior Proctectomy, see chapter lxxiii. of "Treatise on the Surgery of the Alimentary Canal."

‡ *Centralblatt für Chirurgie*, 1895, No. 10, p. 243.

the vagina thoroughly disinfected. A shallow median incision is carefully made in the posterior wall of the vagina, reaching to the sphincter ani. The rectum is separated first at the anal extremity, and then pulled up by the assistant towards the symphysis, by which means the requisite length of the gut is detached.

It remains to refer briefly to three other methods of dealing with disease situated high up in the rectum, or of a character too fixed to remove.

(1) *Removal by Maunsell's method* (see page 389).—The abdomen is opened, an incision made in the sigmoid, and the diseased segment invaginated into the latter, brought out of the intestinal orifice, and removed, union of the gut ends being then effected as in the same operation for intussusception.

(2) Uhlmann * proposes to expose the rectum by an ordinary Kraske, bring down a piece of intestine and suture it into the rectum below the seat of disease. The proposed operation is termed "Colo-rectostomy."

(3) Bacon † suggests opening the abdomen and stitching a coil of intestine to the rectum. When adhesions have sufficiently formed, an opening is made into the bowel from the rectum, below the disease in the latter. The method is well described by illustrations.

6. **Proctorrhaphy.**—The term is used to indicate suturing the ends of the rectum after excision. If, however, an endeavour is to be made to acquire some uniformity in the terminology of operations upon the alimentary canal, the name should strictly apply to narrowing the dilated rectum by simply folding in and securing a longitudinal section of the gut wall, as is effected in like conditions in other parts of the canal. Such an operation has been successfully performed in cases of Prolapsus recti. The prolapsed and enlarged bowel is narrowed in its calibre, by inserting two rows of buried sutures, which have the effect of doubling in a longitudinal fold.

7. **Proctopexy.**—An operation performed for fixing the rectum in cases of prolapse. (See page 474.)

* *Annual of the Universal Medical Sciences*, 1890, vol. iii. D—35.

† *Ibid.* 1895, vol. iii. D—11.

8. **Proctoplasty.**—The term is applied to the various operations employed to open up and transplant into the perineum the rectum in cases of imperforate anus (see page 481). In view of the specific application of the affix in the case of the stomach and the intestine, it would be wiser to abolish the use of term in this connection, and employ it only for cases of stricture of the rectum, where a similar operation to that in other regions is performed. That this particular mode of treating a rectal stricture has already been successfully accomplished renders such a limitation of the term the more desirable.

9. **Rectal Electrolysis.**—Used for the treatment of stricture of the rectum. (See page 442.)

10. **Rectal Cauterisation.**—Used for the treatment of prolapse. (See page 472.)

CHAPTER LXI.

RECTAL ADMINISTRATIONS.

Nutritive and therapeutic enemata.—The importance of utilising the absorptive powers of the mucous membrane of the rectum, in the surgery of the alimentary canal, is so great, that a separate though brief reference to the subject seems a fitting conclusion to the present work.

It may be considered from two aspects—that of alimentation, and that of medication.

Alimentation.—The administration of food by the rectum is of importance in all cases where its introduction into the stomach is impossible, or fraught with risks of injury to parts which have been operated upon.

Prior to giving the enema, an ordinary copious injection of warm water should be employed, in order to empty the part, and cleanse it. The patient should lie either on the back or the side, and remain in the recumbent position for some time after the administration.

For introducing the aliment, either a syringe or a filler or funnel attached to an india-rubber tube may be used. A rectal tube of at least six inches in length should be connected with the india-rubber tube or the nozzle of the syringe, and introduced as far up the bowel as possible. This high introduction of the food is of considerable importance, as bringing it into relation with a larger absorptive surface, and also rendering it possible for the material to find its way into the colon.

No sudden or great force should be used in injecting the aliment. If a filler and tube is used, the former should be held about two feet above the bed, and the material allowed to gravitate slowly into the bowel.

The quantity administered should be from two to six ounces, and warmed to about the temperature of the body. From two to four enemata may be given daily, the number varying with the quantity and the quality of nutrient used; and if the bowel does not empty itself naturally within forty-eight hours, a copious water injection should be given before repeating the enema. It has been shown that the ingredients most readily absorbed are such as can be held in solution; hence albumen as such is not taken up, and must be peptonised.

The following are good formulæ for rectal alimentation taken from Eugene Forster's article in the "Reference Handbook of the Medical Sciences."*

Leube's pancreatic meat emulsion.—"Take about five ounces of finely scraped meat, chop it still finer, and add to it one ounce and a half of finely chopped pancreas free from fat, then add about three ounces of lukewarm water, and stir to the consistence of a thick pulp." This constitutes the quantity for a single injection.

Mayet's preparation.—"Take of fresh pancreas of the ox from 150 to 200 grammes, and of lean meat 400 to 500 grammes. Bruise the pancreas in a mortar with tepid water at a temperature of 37° C., and strain through a cloth. Chop the meat and mix it thoroughly with the fluid which has thus been strained, after separating all the fat and tendinous portions. Add the yolk of one egg. Let stand for two hours, and administer at the same

* Vol. ii. p. 693.

temperature." The quantity made is supposed to be sufficient for twenty-four hours' nourishment, and should be administered in two doses.

Rennie's formula.—"To a bowl of good beef tea add half a pound of lean, raw beefsteak pulled into shreds. At 99° F. add one drachm of fresh pepsin and half a drachm of dilute hydrochloric acid. Place the mixture before the fire and let it remain for four hours, stirring frequently. The heat must not be too great, or the artificial digestive process will be stopped altogether."

In recent years much has been done to simplify the process of preparing food, but there are those who still prefer to use the entirely fresh and recently prepared ingredients rather than any of the condensed and more or less artificial preparations now so abundantly to be obtained in the market. Many of the latter, however, have been shown experimentally to be capable of sustaining life for comparatively prolonged periods and fulfilling therefore all the requirements of rectal alimentation.

Some of these ready-made preparations are practically foods in themselves, while others are intended to be added to certain quantities of aliment for the purpose of digesting them.

The following are some of the preparations met with in commerce. As full instructions accompany each substance there is no need to introduce any particulars here.

Pepsin (B.P.); Pig's Pepsin; Saccharated Pepsin; Armour's Lactated Pepsin; Pure Pancreatin; Liquor Pancreaticus (Benger); Beef Peptonoids (Carnick and Co.) in powders; Liquid Peptonoids; Zymine Peptonising Powders (Fairchild); Zyminised (Peptonised) Suppositories (milk); Zyminised (Peptonised) Suppositories (beef).

Forster speaks highly of the following simple nutrient enema:

Carnick's Beef Peptonoids one to four drachms, milk, beef tea, or rice water, four to six ounces given twice daily.

In the use of enemata it is advisable not to continue too long with one particular kind, but rather to employ every now and again one containing different ingredients. If the rectum becomes intolerant or irritable, a few drops of tinctura opii should be added to the enema. When

stimulants appear needed, half an ounce or so of brandy may be mixed in. Ewald prefers to add red wine to each enema.

The absorptive power of the rectum for fluids has led to its being made use of as a means of getting water into the system when its administration in large quantities by the mouth might derange the stomach. Thus the injection of considerable quantities of warm water has proved to be of great service in cases where much blood has been lost, and in which shock is a prominent symptom. As thus given it is supposed to act in the same way as when normal saline solution is used for intravenous injection. In cases of excessive thirst from fever, and after certain abdominal operations, warm water given *per rectum* has often a very beneficial effect in allaying this troublesome and trying symptom.

Therapeutics.—Drugs are introduced into the rectum for the purpose of producing either local or general effects. In form they are either fluid or solid, in the latter case they constitute the suppositoria.

It is usual to classify enemata according to their action; thus there are purgative, anthelmintic, astringent, and sedative. Others are used by the physician, but these comprise those mostly in use in surgery.

Purgative enemata.—The mechanical effect of large quantities of fluid in inducing peristaltic action of the bowel has already been referred to (see page 487). It is possible, however, to bring about the desired effect by using a less quantity of water and adding to it some purgative drug. Thus castor oil or turpentine, an ounce of each, may be added to and well shaken up with six to ten ounces of thin gruel; or a solution can be made containing sulphate of magnesia. An enema of aloes consists of aloes two scruples, carbonate of potash fifteen grains, and barley water half a pint; or one containing colocynth consists of extract of colocynth half a drachm, soft soap one ounce, and water a pint; mix and rub together.

Glycerine is now much used, and is sometimes very powerful in its action, as was once observed by myself in the case of a patient who had been operated upon for hæmorrhoids some days previously. It caused much straining and very copious hæmorrhage. From one to two drachms are injected

by a suitable syringe, and usually in from five to thirty minutes action of the bowels will follow. Glycerine suppositories are now made containing in some of the forms 95 per cent. of glycerine. Their action is said to be attended with less spasm than when pure glycerine is injected.

Anthelmintic enemata.—Thread worms and round worms are both met with in the rectum, the former more frequently. Their presence in children is not unfrequently the cause of prolapse. Strong solutions of salt and water, or of quassia and water, will sometimes prove sufficient. Or an enema composed of one to four drachms of spirits of turpentine mixed with the yolk of an egg, and added to four to eight ounces of water, may be given repeatedly until the worms are destroyed. Two drachms of assafœtida or aloes in water also answer equally well.

Astringent enemata.—Solutions of many of the well-known astringents, both vegetable and mineral, may be used for rectal injection. Among the former is gallic acid, two grains of which should be mixed with each ounce of water. The mineral astringents comprise alum, sulphates of copper and zinc, salts of iron, acetate of lead, and nitrate of silver. Most of these may be used in strengths varying from one to three grains of the salt to the ounce of water. Suppositories of hamamelin or injections of hazeline are also much in use.

Sedative enemata.—Enemata of this description are more frequently given for the production of a general than a local effect. And inasmuch as the result is practically the same whether the drug be given by the mouth or the rectum, all substances in the pharmacopœia which are described as sedative in their effect upon the nervous system can be introduced—provided the form is suitable—as well by the rectum as by the mouth. Much discussion has arisen regarding the relative quantities which should be given *per rectum*, as compared with what is usually administered by the mouth. Eugene Forster holds that from his experience the effect produced by a certain quantity given by the mouth is the same as that which results from the same quantity given *per rectum*. Others maintain that proportionately more should be given by the bowel; while there are those who contend that the quantity should be proportionately less. The simplest plan would therefore

seem to be, and certainly the safest, to prescribe for an enema the same dose as that given for administration by the mouth. Among narcotics and sedatives which may be used as enemata are opium, morphia, belladonna, stramonium, cannabis indica, assafœtida, conium, lobelia, gelseminum, musk, chloral, bromides of potassium and sodium.

INDEX.

ABNORMALITIES of small intestines, 304; of large intestine, 350; of rectum, 475
Actinomycosis of œsophagus, 37; of large intestine, 320
Adhesions of the stomach, 163, from gastric ulcer, 144; of large intestine, 324
Albert's method of performing jejunostomy, 383
Anæsthetics in œsophageal affections, 21
Anatomy of œsophagus, 3; stomach, 103; duodenum, 195; ileum, 214; jejunum, 214; large intestine, 309; rectum, 411
Anus, artificial, operation for formation of, 402, for closure of, 405
Appendicectomy, 406
Appendicitis, 357, pathology, 357, etiology, 358, symptoms, 361, diagnosis, 366, prognosis, 367, treatment, 370, operation, 373
Appendix vermiformis, 354, diseases of, 376
Artificial anus, operation for, 402
Atresia of œsophagus, 87; of duodenum, 211; of rectum, 476

BARACZ, operation of bowel occlusion, 401
Bernay's operation for curetting pylorus, 192
Bircher's method of performing gastrorrhaphy, 176
Bone bobbins, Mayo Robson's, 393
Bougies, œsophageal, introduction of, 92, passage of, 488; rectal, 439
Burns, the cause of ulceration of duodenum in, 205

CARCINOMA of œsophagus, 39, pathology, 39, symptoms, 43, complications, 45, diagnosis, 45, differential diagnosis, 47, prognosis, 50, treatment, 51, by intubation, 52, by operation, 56; of stomach, 146, diagnosis, 147, treatment, 148; of duodenum, 208; of small intestine, 296; of large intestine, 337, pathology, 337, symptoms, 341, treatment, 345; of rectum, 449, pathology, 449, symptoms, 455, diagnosis, 457, prognosis, 458, treatment, 464
Cardiac obstruction of stomach, 150
Clamps for bowel, 178
Colectomy, 398, Paul's method of performing, 399
Colitis, general ulcerative, 317; membranous, treatment of by colostomy, 318
Colon, idiopathic dilatation of, 348. *See also* Various affections of large intestine
Colopexy, 402
Coloplasty, 402
Colostomy, 396
Colotomy, 396
Concretions, intestinal, 294
Contractions in gastric ulcer, 145
Contusions of stomach, 116; of small and large intestine, 218
Credé's rectal bougies, 441
Curetting of pylorus, 192

DILATATION of œsophagus, 77; of stomach, 161; of large intestine, idiopathic, 348
Diverticulum of œsophagus, 80, symptoms, 84, treatment, 86, by operation, 99; of duodenum, 212; of rectum, 485
Duodenal hæmorrhage, 198, 200, 201, 202, 209
Duodenectomy, 213
Duodenoplasty, 214

Duodenostomy, 213
Duodenotomy, 214
Duodenum, anatomy of, 195, injuries of, 197, rupture of, 197, foreign bodies in, 199, diseases of, 199, chronic ulceration of, 200, acute ulceration of, 205, tumours of, 207, malignant disease of, 208, stricture of, 210, congenital atresia of, 211, diverticulum of, 212, perforation of, from external causes, 212, operations upon, 213
Dupuytren's enterotome, 405

Electrolysis for stricture of gullet, 67, method of performing, 94; for stricture of rectum, 442, 498
Embolism of mesenteric vessels, 352
Enemata, nutrient, 498, therapeutic, 501, method of administering, 487
Enteritis, acute, 218; chronic, 218
Entero-anastomosis, 385
Entero-enterostomy, 395
Enteroliths, 294, 330
Enteroplasty, 395
Enterostomy, 381, Nélaton's operation of, 381
Enterotomy, 384

Fæcal accumulations, 330, results of, 331, treatment of, 333
Fæcal fistulæ, operation for closure of, 405
Fistula, of œsophagus, 17; of stomach, 143; bi-mucosa, 143, 185; fæcal, operation for closure of, 405
Foreign bodies in œsophagus, 15; in stomach, 121; in duodenum, 199; in intestine, 239; skiagraphy for, 245; in rectum, 419
Frank's method of performing gastrostomy, 168

Gall-stones in large intestine, 330; producing acute obstruction, 290
Gastrectasia, 161
Gastrectomy, 174
Gastric adhesions, 163
Gastric carcinoma. *See* Carcinoma of stomach, 146
Gastric dilatation, 161
Gastric fistulæ, 143, 184
Gastric hæmorrhage, 118, 119, 120, 123, 134, 148, 164, 184
Gastric tumours. *See* Tumours of stomach, 146
Gastric ulcer, 129, character of, 131, excessive hæmorrhage in, 134, perforation of, 135, excision of, 139, purulent collections in, 141, fistulæ in, 143, adhesions in, 144, causing stricture of pylorus, 145, internal contractions in, 145
Gastric ulcer, perforated, methods of treatment of, 139
Gastro-diaphany, 115
Gastro-enterostomy, 177, von Hacker's method, 181, Kocher's method, 181, Rutherford Morrison's method, 183, Woelfler's method, 177, untoward results of, 183, for obstruction at pylorus, 160, in gastric ulcer, 134, 135
Gastro-liths, 126
Gastro-pexy, 176
Gastrorrhaphy, 176
Gastroscopy, 115
Gastrostomy, 167, Frank's method, 168, Kader-Senn's method, 170, Witzel's method, 171; for stricture of gullet, 70; for carcinoma of gullet, 57
Gastrotomy, 165; for extraction of foreign bodies in gullet, 25
Gun-shot wound of stomach, 120; of intestine, 232, treatment of, 236
Günzberg's test for free hydrochloric acid, 109

Hæmorrhage after gastro-enterostomy, 184
Hæmorrhage from œsophagus, 7, 15, 17, 33, 34, 45, 51, 90; from stomach, 118, 119, 120, 123, 134, 148, 164, 184; from duodenum, 198, 200, 201, 202, 209
Hæmorrhage in gastric ulcer, 134
Hair tumours in stomach, 126
Heineke-Mikulicz operation of pyloroplasty, 190
Hernia, internal, into normal peritoneal fossæ, 254; through adventitious apertures, 255; through congenital apertures, 255
Hernia of large intestine, 324

Ileo-cæcal valve, anatomy of, 313; abnormalities of, 352
Ileostomy, 383
Ileum, anatomy of, 214
Imperforate rectum, 476

Incised wounds of intestine, 227, treatment of, 231
Inflammation of œsophagus, 26; of small intestine, 218; of large intestine, 315; of rectum, 423
Injuries of œsophagus, 6; of stomach, 116; of duodenum, 197; of small intestine, 218; of large intestine, 314; of rectum, 417
Intestinal concretions, 294; neuroses, 308
Intestinal obstruction, acute, treatment of distended gut in, 264; after gastro-enterostomy, 184
Intestine, foreign bodies in, 239; gun-shot wounds of, 232
Intestine, large, anatomy and physiology of, 319, injuries of, 314; inflammation of, 315, ulceration of, 315, actinomycosis of, 320, cicatricial stricture of, 320, adhesions of, 324, hernia of, 324, kinking of, 326, intussusception of, 326, volvulus of, 328, fæcal accumulation in, 330, gall-stones in, 330, innocent tumours of, 335, carcinoma of, 337, sarcoma of, 347, idiopathic dilatation of, 348, abnormalities of, 350, misplacements of, 350, mal-development of, 351
Intestines, nomenclature of operations upon, 379
Intestines, operations upon, 377. *See also* Special operations
Intestines, small, anatomy of, 214, contusion of, 218, inflammation of, 218, rupture of, 221, punctured and incised wounds of, 227, tubercular ulceration of, 245, typhoid ulceration of, 247, obstruction of, 253, volvulus of, 281, innocent tumours of, 295, carcinoma of, 296, sarcoma of, 297, stricture of, 283, congenital abnormalities of, 304
Intussusception, of small intestine, 267, pathology of, 268, cause of obstruction in, 270, symptoms of, 276, treatment of, 278, laparotomy in, 280; of large intestine, 326; of rectum, 474

JEJUNOSTOMY, 382, Albert's method of performing, 383, Maydl's method, 382
Jejunum, anatomy of, 214

KADER-SENN'S method of gastrostomy, 170
Kinking of small intestine, 265; of large, 326
Kocher's method of gastro-enterostomy, 181; of pylorectomy, 188
Kraske's proctectomy, 492

LEMBERT'S suture, 387; modifications of, 387
Loreta's digital divulsion of pylorus, 191
Lumbar anus, operation for, 405

MAL-DEVELOPMENT of large intestine, 351
Malformations of œsophagus, 87; of rectum, 475
Maydl's method of jejunostomy, 382
Mayo Robson's bone bobbins, 393
Meckel's diverticulum, 257; strangulation by, 258
Membranous colitis, 318
Mesenteric vessels, embolism and thrombosis of, 352
Misplacements of large intestine, 350
Murphy's button, 181; method of using, 394; accidents following use of, 185; use of in gastro-enterostomy, 182

NÉLATON'S method of performing enterostomy, 381
Neuroses, intestinal, 308; of rectum, 485

OBSTRUCTION of small and large intestine from external pressure, 299
Obstruction of pylorus, 151. *See* Pylorus, obstruction of
Obstruction of small intestine, 253, by internal herniæ, 254, by strangulation through apertures, 255, by bands, 255, by adhesions, 265, by kinking, 265, by intussusception, 267. *See also* Intussusception; by volvulus, 281, by stricture, 283, by gall-stones, 290, by tumours of bowel-wall, 295
Obstruction of large intestine, 320, by cicatricial stricture, 320, by internal herniæ, 324, by adhesions, 324; by

kinking, 326, by intussusception, 326, by volvulus, 328
Œsophageal hæmorrhage, 7, 15, 17, 33, 34, 45, 51, 90
Œsophageal instruments, coin-catcher, 23, forceps, 24, probang, 22
Œsophagectomy, cervical, 98; thoracic, 99
Œsophagismus. 72. *See* Spasm of œsophagus
Œsophagitis, traumatic, 26, idiopathic, 27, of children, 28, membranous, 29, pellicular, 29, aphthous 30, chronic, 30, phlegmonous, 31, catarrhal, 32, follicular, 32, croupous, 32
Œsophagostomy, 98, for stricture of gullet, 69, for carcimona of gullet, 57
Œsophagotomy, internal, 93; for extraction of foreign bodies, 24; for stricture of gullet, 67
Œsophagotomy, external (cervical), 95; for stricture of gullet, 68; (thoracic), 97
Œsophagotomy tube, 98
Œsophagus :—
Abnormalities of, 77, malformation of, 87, dilatation of, 77, diverticulum of, 80, *see* Diverticula of œsophagus; torsion of, 89, distortion of, 91
Anatomy of, 3, course and extent of, 3, relations of, 4, attachments of, 4, calibre of, 4, structure of, 5; physiology of, 5; time of passage of food down, 5
Diseases of: inflammation of, 26, *see* Œsophagitis; submucous abscess of, 31, ulcer, 32, varicose veins, 34, tuberculosis, 36; tumours, 37, *see* Tumours of œsophagus, actinomycosis, 37, paralysis, 70, perforation, 91, fistulæ, 17, stricture, 58, *see below*
Injuries of, 6, internal injuries, 6, treatment of, 8; external injuries, 9, treatment of, 10; rupture, 11, treatment of, 12; foreign bodies impacted in, 15, treatment of, 20
Operations upon, 92. *See* Special operations
Pressure effects upon, 89
Stricture, cicatricial, of, 58, treatment of, 64, by gradual dilatation, 64, by a rapid dilatation, 66, by electrolysis, 67, by internal œsophagotomy, 67, by external œsophagotomy, 68, by œsophagostomy, 69, by gastrostomy, 70
Operating-table for emergency cases, 304
Operations upon œsophagus, 92; stomach, 164; small and large intestine, 377; rectum, 487. *See* Special operations
Operations upon intestines, table of, 380

PARALYSIS of œsophagus, 70
Paul's glass tubes for colectomy, 400; method of performing colectomy, 399
Penetrating wounds of stomach, 119; of intestine, 227, treatment of, 231
Perforation of œsophagus, 91; of gastric ulcer, 135
Periproctitis, 426
Peritonitis, 300; different forms of, 302
Polypus of rectum, 443
Proctectomy, 493; perineal, 491; posterior, 492; vaginal, 496
Proctitis, 423
Proctopexy, 497
Proctoplasty, 498
Proctorrhaphy, 497
Proctotomy, internal, 489; external, 490
Prolapse of rectum, 467, treatment of, 469
Pylorectomy, 186, Kocher's method of, 188; and gastro-enterostomy, combined operation of, 189; for obstruction at pylorus, 160
Pyloroplasty, 190, for obstruction at pylorus, 160
Pylorus, operation of curetting, 192; digital divulsion of, 191
Pylorus, obstruction of, 151, dilatation of stomach in, 155, symptoms of, 152, diagnosis of, 153, prognosis in different operations for, 159, treatment in, 156
Pylorus, stricture of, in gastric ulcer, 145

RECTAL alimentation, 498; bougies, 439
Rectocele, 474
Rectum :—
Anatomy and physiology of, 411;

surgical anatomy of, 414; method of examining, 416
Diseases of: inflammation, 423; non-malignant ulceration, 427, *see* Ulceration of rectum; cicatricial stricture, 434, *see* Stricture of rectum; innocent tumours, 443, *see* Tumours of rectum; polypus, 443; carcinoma, 449, *see* Carcinoma of rectum; sarcoma, 466; prolapse, 467; intussusception, 474; hernia, 474; malformations, 475; imperforate, 476; congenital stricture, 484; diverticulum, 485; neuroses, 485; external influences, 486
Injuries of, 417; foreign bodies in, 419; fæcal concretions in, 419
Operations upon, 490; cauterisation of, 498; electrolysis, 498
Rupture of œsophagus, 11; of stomach, 117; of duodenum, 197; of small intestine, 221, treatment of, 225; of large intestine, 314
Rutherford-Morrison's method of performing gastro-enterostomy, 183

Sarcoma of stomach, 150; of duodenum, 208; of small intestine, 297; of large intestine, 347; of rectum, 466
Schlatter's operation of gastrectomy, 175
Senn's plates, 391
Short-circuiting, operation of, 395
Sigmoid anus, 402
Sigmoidostomy, 398
Skiagraphy for œsophageal foreign bodies, 18; for œsophageal diverticulum, 86; for gastric conditions, 116; for foreign bodies in stomach, 124; for intestinal foreign bodies, 245
Spasm of œsophagus, 72, treatment of, 76
Stenosis, congenital, of œsophagus, 88
Stomach:—
Anatomy of, 103; physiology of, 106
Diseases of, 127; ulcer of, 129, *see* Gastric ulcer; pseudo-malignant tumours of, 146; vanishing tumours of, 146; effect of external influences upon, 163; pressure of tumours upon, 163. *See also* under Special diseases.
Examination of, and contents, method of obtaining gastric juice from, 108; method for detection of free hydrochloric acid in, 109; method for determining the rate of absorption in, 110; method of determining the motor power of, 111; physical examination of, 112; palpation of, 112; percussion of, 113; succussion of, 114; auscultation of, 114; inflation of, 114
Exploratory operations of, value of, 128
Injuries of, 116; contusions of, 116; rupture of, 117; penetrating wounds of, 119; gun-shot wounds of, 120; foreign bodies in, 121; hair tumours in, 126
Operations upon, 164; lavage, 164; aspiration of, 165. *See* Special operations
Strangulation, internal, of small intestine, symptoms of, 260, treatment of, 263; of large intestine, 324
Stricture, cicatricial, of œsophagus, 58; of duodenum, 210; of small intestine, 283; of large intestine, cicatricial, 320; of rectum, cicatricial, 434, symptoms of, 436, treatment of, 440; congenital, of rectum, 484
Subdiaphragmatic abscess, 142
Suture of bowel, methods of, 386
Symonds' œsophageal tubes, 52
Syphilis of œsophagus, 35

Thrombosis of mesenteric vessels, 352
Torsion of œsophagus, 89
Tuberculosis of œsophagus, 36; of small intestine, 245; of large intestine, 316; of rectum, 408
Tumours of:—
Duodenum, 207
Large intestine, innocent, 335; malignant, 337
Œsophagus, innocent, 37; carcinoma, 39, *see* Carcinoma of œsophagus; sarcoma, 58
Rectum, innocent, 443; polypus, 444; villous, 445; multiple polypi, 445; carcinoma, 449,

see Carcinoma of rectum; sarcoma, 466
Small intestine, innocent, 295; malignant, 296
Stomach, innocent, 146; vanishing, 146; malignant, 146; pressing upon, 163
Typhoid ulceration of small intestine, 247, operation in, 251; of large intestine, 316
Ulcer: of œsophagus, 32; of stomach, 129, *see* Gastric ulcer; of duodenum, chronic, 200, acute, 205; of small intestine, 245; of large intestine, 315; of rectum, 427, tubercular, 428, dysenteric, 428, varicose, 429, syphilitic, 429; non-malignant of rectum, symptoms of, 430, treatment of, 433

Vanishing tumours of stomach, 146; of intestine, 296
Varicose veins of œsophagus, 34
Vermiform appendix, 354
Volvulus of small intestine, 281; of large intestine, 328
Von Hacker's method of gastro-enterostomy, 181

Witzel's method of performing gastrostomy, 171
Wölfler's method of performing gastro-enterostomy, 177

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[*Continued on next page.*

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[*Continued on next page.*

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[*Continued on next page.*

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