A treatise on hernia ... / Translated from the Italian, with notes and an appendix, by John Henry Wishart.

Contributors

Scarpa, Antonio, 1752-1832
Wishart, John Henry, 1782?-1834

Publication/Creation

Edinburgh : T. Bryce, etc., 1814.

Persistent URL

https://wellcomecollection.org/works/h6jpmb8v

License and attribution

This work has been identified as being free of known restrictions under copyright law, including all related and neighbouring rights and is being made available under the Creative Commons, Public Domain Mark.

You can copy, modify, distribute and perform the work, even for commercial purposes, without asking permission.

Wellcome Collection
183 Euston Road
London NW1 2BE UK
T +44 (0)20 7611 8722
E library@wellcomecollection.org
https://wellcomecollection.org

46820/B

A

TREATISE ON HERNIA,

BY

ANTONIO SCARPA.

EDINBURGH:
Printed by James Clarke.

A

TREATISE ON HERNIA,

BY

ANTONIO SCARPA,

PROFESSOR OF CLINICAL SURGERY IN THE UNIVERSITY OF PAVIA.

TRANSLATED FROM THE ITALIAN,

WITH NOTES AND AN APPENDIX,

BY

JOHN HENRY WISHART,

MEMBER OF THE ROYAL COLLEGE OF SURGEONS, AND ONE OF THE SURGEONS TO THE PUBLIC DISPENSARY OF EDINBURGH.

ILLUSTRATED BY FOURTEEN ENGRAVINGS.

EDINBURGH:

PRINTED FOR THOMAS BRYCE & CO. MEDICAL BOOKSELLERS,

13, INFIRMARY STREET; AND

LONGMAN, HURST, REES, ORME, & BROWN, J. CALLOW,

AND T. UNDERWOOD, LONDON.

1814.

James Crawford

30998

WELLCOME
HISTORICAL
MEDICAL
LIBRARY

THIS WORK

IS INSCRIBED TO

JAMES WARDROP, ESQ. F. R. S. E.

SURGEON IN LONDON,

AS A TESTIMONY OF REGARD,

BY

HIS SINCERE FRIEND,

THE TRANSLATOR.

THE

TRANSLATOR'S PREFACE.

The original of the following treatise on Hernia, was published at Milan in 1809 and 1810, in five Memoirs, with ten engravings, in atlas folio.

On carefully perusing the work, it appeared to me that Professor Scarpa, by the very able manner in which he has treated this most important branch of Surgery, has fully maintained the reputation he had previously acquired; and as the expence and difficulty of procuring the original must preclude its being generally known in this country, I conceived that an accurate translation would be useful, not only to students, but even to more experienced surgeons, by enabling them to become ac-

quainted with the many original doctrines and important practical directions which it contains.

The surgical treatment of hernia requiring not only dexterity on the part of the surgeon, but that he should be well versed in the anatomical structure of the parts concerned in the formation of this disease, Professor Scarpa has traced it from its first appearance, and has accurately described its different stages, from the most simple form to the most complicated varieties. He has also particularly pointed out its connection with the contiguous parts, and the relative situation of the arteries liable to be divided in the different operations which are necessary for its cure.

Although the Author has employed very great care in this investigation, his description is not always clear, and it will be perhaps with difficulty understood, except by those who are familiar with the dissection of these parts. This circumstance, in my opinion, can be ascribed to no other cause but the imperfection of the language of anatomy generally used. To remedy this defect, it appeared to me that it would

be a great advantage to introduce the ingenious and precise Nomenclature of Dr. Barclay. Mr. Astley Cooper, in the preface to his work on Inguinal Hernia, notices the confusion often introduced into anatomical description by the want of definite terms to express the relative situation of parts. He observes, that he hesitated to adopt the Nomenclature of Dr. Barclay, only on account of the total change in the language of a practical work. Subsequent writers have expressed an equally favourable opinion of the utility of this Nomenclature, especially with regard to the subject of hernia, and have regreted that it was not more generally adopted.

The sentiments expressed by these authors, the conviction of its superior utility, and its becoming daily more generally used, have determined me to introduce this Nomenclature in the following treatise. But, as there may be still many surgeons who are not thoroughly acquainted with it, I thought it would be better to leave the old terms as used by Professor Scarpa, and to add those of Dr. Barclay in the form of notes. I have employed them in many in-

stances, even where there could be no ambiguity about the meaning of the author, with a view of favouring their more general use, and as an additional assistance, I have added the following list of words which occur in the course of the work, and a table explaining the new terms.

The ambiguous words are, *up*, *upper*, *high*, *low*, *higher*, *lower*, *above*; *below*, *over*, *under*, *upwards*, *downwards*; *backwards*, *forwards*, *before*, *behind*, *down*; *head*, *top*, *bottom*, *in*, *out*, *inner*, *outer*, *within*, *without*; *internally*, *externally*, *superior*, *inferior*, *internal*, *external*, *beneath*, *beyond*.

As the Author, at the beginning of his second Memoir, mentions, that it was not his intention to describe the steps of the operation, I thought that it would make the work more complete, to add not only a short account of the usual mode of operating, but likewise to point out the diagnosis of inguinal and femoral hernia, and to describe the methods most frequently employed in applying the taxis, and the general plan of treating the patient after reduction, both in cases where the taxis succeeded, as well as in those in which it

was necessary to have recourse to the operation.

I have also added a short description of the species called *rare* hernia, principally drawn up from the works of those writers who have treated of them, as I have only met with two cases of hernia of the bladder, the one passing out under the femoral arch in a woman, and the other in the perineum of a man, and I have not had an opportunity of examining any of these herniæ in the dead subject.

On the subject of gangrened hernia, M. Cayol, the French translator, has given a very interesting history of some cases, proving, in a satisfactory manner, that a loop of intestine in hernia may form an *intus-susception*, and that the *intus-suscepted* or *invaginated* portion being strangulated, and afterwards attacked by gangrene, may be discharged by stool without the continuity of the canal being interrupted. I have inserted an abstract only of his first case, as it contains many observations merely conjectural and involved in much theoretical discussion; the second case I have given in detail, as it is more satisfactory, and the

conclusions drawn from it can admit of no dispute. The Memoir likewise contains a variety of cases of *volvulus* without hernia, but as many of these have been recently published in works well known in this country, I have referred to the original works, giving only the more prominent features of the individual cases.

With regard to the Plates, my chief object has been to give accurate copies of the original, and although they are comparatively of a small size, I think they will be found to give a very clear and precise idea of the formation of the disease, and of the relative situation of the contiguous parts.

TABULAR OUTLINE OF BARCLAY'S NOMENCLATURE.

I. GENERAL TERMS.

USED AS ADJECTIVES.		USED AS ADVERBS.	
New Terms.	*Old Terms.*	*New Terms.*	*Old Terms.*
Mesial.	*Internal.*	Mesiad.	*Inwards, within.*
Lateral.	*External.*	Laterad.	*Outwards, without.*
Dextral.	*Right.*	Dextrad.	*Towards the right.*
Sinistral.	*Left.*	Sinistrad.	*Towards the left.*
Peripheral.	*External, Superficial.*	Peripherad.	*Outwards; towards the surface.*
Central.	*Internal, Deep-seated.*	Centrad.	*Inwards, within.*

II. TERMS PROPER TO THE HEAD.

Coronal.	*Superior* in Man. *Anterior* in Quadrupeds.	Coronad.	*Upwards, above* in Man. *Forwards, before* in Quad.
Basilar.	*Inferior* in Man. *Posterior* in Quadrupeds.	Basilad.	*Downwards, below* in Man. *Backwards, behind* in Quad.
Glabellar.	*Anterior* in Man. *Superior* in most Quadrupeds.	Glabellad.	*Forwards, before* in Man. *Upwards, above* in most Quad.
Inial.	*Posterior* in Man and most Quadrupeds.	Iniad.	*Backwards, behind.*
Antinial.	*Anterior and inferior* in Man. *Anterior* in most Quadrupeds.	Antiniad.	*Forwards and downwards* in Man. *Forwards* in most Quad.

III. TERMS PROPER TO THE NECK AND TRUNK.

Atlantal.	*Superior* in Man. *Anterior* in Quadrupeds.	Atlantad.	*Upwards, above* in Man. *Forwards, before* in Quad.
Sacral.	*Inferior* in Man. *Posterior* in Quadrupeds.	Sacrad.	*Downwards, below* in Man. *Backwards, behind* in Quad.
Sternal.	*Anterior* in Man. *Inferior* in Quadrupeds.	Sternad.	*Forwards, before* in Man. *Downwards, below* in Quad.
Dorsal.	*Posterior* in Man. *Superior* in Quadrupeds.	Dorsad.	*Backwards, behind* in Man. *Upwards, above* in Quad.

IV. TERMS COMMON TO BOTH KINDS OF EXTREMITIES.

USED AS ADJECTIVES.		USED AS ADVERBS.	
New Terms.	*Old Terms.*	*New Terms.*	*Old Terms.*
Proximal.	*Superior* in most cases.	Proximad.	*Upwards, above* in most cases.
Distal.	*Inferior* in most cases.	Distad.	*Downwards, below* in most cases.

V. TERMS PROPER TO THE ATLANTAL OR SUPERIOR EXTREMITIES.

Radial.	*Anterior* or *external*, according as the palm of the hand is turned towards the thigh or directed forwards.	Radiad.	*Forwards* or *outwards*; *before* or *without*, according to the direction of the palm.
Ulnar.	*Posterior* or *internal*, as above.	Ulnad.	*Backwards* or *inwards*; *behind* or *within*, as above.
Anconal.	*External* or *posterior*, as above.	Anconad.	*Outwards* or *backwards*, *without* or *behind*, as above.
Thenal.	*Internal* or *anterior*, as above.	Thenad.	*Inwards* or *forwards*, *within* or *before*, as above.

VI. TERMS PROPER TO THE SACRAL OR INFERIOR EXTREMITIES.

Tibial.	*Internal.*	Tibiad.	*Inwards, within.*
Fibular.	*External.*	Fibulad.	*Outwards, without.*
Rotular.	*Anterior.*	Rotulad.	*Forwards, before.*
Popliteal.	*Posterior.*	Poplitead.	*Backwards, behind.*

VII. TERMS PROPER TO THE SANGUIFEROUS SYSTEM.

Pulmonic.	Veins.	*Venæ Cavæ.*	Pulmonad.	*Towards the lungs.*
	Sinus.	*Right or Anterior.* — *Sinus.*		
	Auricle.	*Right or Anterior.* — *Auricle.*		
	Ventricle.	*Right or Anterior.* — *Ventricle.*		
	Arteries.	*Pulmonary Artery and its branches.*		
Systemic.	Veins.	*Pulmonary Veins.*	Systemad.	*Towards the general system.*
	Sinus.	*Left or Posterior.* — *Sinus.*		
	Auricle.	*Left or Posterior.* — *Auricle.*		
	Ventricle.	*Left or Posterior.* — *Ventricle.*		
	Arteries.	*Aorta and its branches.*		

EXPLANATION OF THE PRECEDING TABLE.

THE terms of this Nomenclature are derived from parts of the body, which are found in most vertebral animals, and being fixed and determinate, can never confound or mislead. Some of these terms are general, applying indiscriminately to every part of the animal body; but most of them refer to some particular region or organ of the body.

Of the *general* terms, the most universal, and perhaps the most useful, is that which respects an imaginary plane supposed to be drawn vertically through the middle of the body, so as to divide it into two equal and similar halves. This is called the *mesial* plane; and that surface of a part or organ which looks towards this plane is said to be *mesial*, or to have a *mesial* aspect. Those which are situated in the opposite direction, or on either *side* of the plane, are *lateral*, being *dextral* or *sinistral*, according as they lie to the *right* or *left* of the mesial plane.

Instead of *external* and *internal*, usually applied to denote the surface and the deep-seated parts of an organ, Dr. Barclay employs *peripheral* and *central*; the former denoting the aspect or position at or next the *surface*, the latter those next the *centre* of an organ, or of the body in general.

The particular terms refer to the head; the trunk; the extremities; and the sanguiferous system.

The terms referring to the head, are derived from the *corona* or top of the head; the *base* of the skull; the *inion*, or most protuberant part at the back of the head; and the *glabella*, or space between the eyebrow. The aspect or position of those parts next the *corona* are *coronal*; that of those next the *base*, *basilar*; that of those next the *glabella*, *glabellar*;

and that of those next the *inion, inial.* The *glabella* is not at the greatest rectilineal distance from the *inion,* a distinction, which belongs to the chin in man, and the muzzle in most inferior animals. These parts are called by Dr. Barclay *antinion,* and the aspect or position that regards them is called *antinial.*

The terms proper to the *trunk* are also four; derived from the *sternum* or breast-bone; the *dorsum* or back; the *atlas,* or first *vertebra* of the spine; and the *sacrum* or rump-bone. According as parts or surfaces respect one or other of these fixed points, they are *sternal, dorsal, atlantal,* or *sacral.*

The extremities are *atlantal* or *sacral,* according as they are situated next the atlas, or next the sacrum. Each pair of the extremities, and each of their component parts, have a *proximal,* and a *distal* end; the former being that *nearest* the trunk, the latter that most *remote* from it.

Four proper terms belong to the atlantal, and as many to the sacral extremities. Thus, as the former have a *radius,* an *ulna,* an *ancon,* (or *olecranon,*) and a *thenar* (or palm;) so in these, the aspects and positions are *radial, ulnar, anconal,* and *thenal.* Again, as in the sacral extremities, there are a *tibia,* a *fibula,* a *rotula,* and a *poples,* (or ham;) so the aspects and positions here are *tibial, fibular, rotular,* and *popliteal.* The term *volar,* in the atlantal extremities, is restricted, as in common anatomical language, to the parts within the *palm of the hand*; while *plantar,* in the sacral extremities, is in like manner restricted to those within the *sole of the foot.*

CONTENTS.

Page

THE AUTHOR'S PREFACE 1

MEMOIR FIRST.

OF INGUINAL AND SCROTAL HERNIA.

General plan and division of this memoir 15
Of the external oblique muscle 1
Of the aponeurosis of the fascia lata 23
Of the internal oblique muscle 24
Of the transverse muscle 26
Of the inguinal ring, and inguinal canal 28
Of the peritoneum 32
Of the depressions of the peritoneum 36
Of the cellular substance which connects the peritoneum to the muscular parietes 37
Of the cellular substance of the spermatic cord 38
Of the epigastric artery 40
Of the immediate cause of hernia 42
Observations in support of the preceding doctrine 46
Formation and progress of the hernial sac 49
Situation of the hernial sac with regard to the spermatic cord 53
Of the changes which the cremaster muscle undergoes in old hernia 55
Situation of the cremaster muscle with regard to the hernial sac 56
Of the changes which take place in the inguinal ring during the progress of a hernia 59

Page

Of the changes which are observed in the hernial sac, and in the surrounding cellular membrane 60
Of the possibility of reducing the hernial sac 65
Of the changes which happen in the situation of the spermatic vessels, in large scrotal herniæ 70
Case of large hydrocele, where the spermatic artery was wounded 76
Of the change of situation of the epigastric artery, with regard to the inguinal ring, and the neck of the hernial sac 78
Hesselbach's division of inguinal hernia into *external* and *internal* 82
Of congenital inguinal hernia 85
Comparison of congenital with common scrotal hernia 88
Of double inguinal hernia on the same side 90
Changes which hernia produces in the situation and texture of the viscera 94
Mode of distinguishing inguinal omental hernia from hydrocele of the spermatic cord 97
Of the construction and application of trusses 100

MEMOIR SECOND.

OF THE COMPLICATIONS OF INGUINAL AND SCROTAL HERNIA.

Object of this Memoir 116
Of the incision of the integuments in the operation for old scrotal hernia 116
Of the mode of opening the hernial sac 119
Of relieving the stricture of the ring and of the neck of the hernial sac 122
Direction which it is necessary to give to the incision of the ring, and of the neck of the hernial sac, in order to avoid the epigastric artery 126
Of the causes of strangulation 130

Page
State of the neck of the hernial sac predisposing to strangulation 131
Constriction of the neck of the sac 134
Constriction of the neck of the tunica vaginalis in congenital hernia 136
Of constrictions which sometimes occur in the body of the hernial sac 138
Symptoms of the strangulation caused by the neck of the hernial sac 141
Of the mode of dividing the neck of the hernial sac 144
Mr. Cooper's mode of dividing the stricture.—*Note* 146
Symptoms of stricture of the body of the hernial sac 147
Of strangulation caused by twisting of the bowels 148
Of strangulation of the intestine by the omentum 149
Second variety of strangulation of the intestine by the omentum 153
Third variety of the same species of strangulation 160
Fourth variety 161
Observations on the preceding facts 165
Of strangulation of the intestinal canal formed by the appendix vermiformis 168
Of strangulation occasioned by the rupture of the hernial sac 170
Of spasmodic strangulation 173
Mr. A. Cooper's explanation of spasmodic stricture.—*Note* 177
Of adhesions in general 179
Of the gelatinous adhesion 180
Of the filamentous or membranous adhesion 181
Mode of removing the two first species of adhesion 184
Of the fleshy adhesion 185
Of the practice to be followed in a case of *unnatural* fleshy adhesion 187
Of *natural* fleshy adhesion 194
Of *natural* fleshy adhesion in scrotal hernia of the right side 195

Page
Of the formation of herniæ of the cæcum, and right colon 197
Of the *natural* fleshy adhesion in scrotal hernia of the left side 200
Causes of hernia of the cæcum 202
Of herniæ occurring unprovided with a hernial sac 205
Of reducible and irreducible hernia of the cæcum 208
Case of the *natural* fleshy adhesion mentioned by Petit 209
Cases of herniæ of the left portion of the colon, complicated with *natural* fleshy adhesion 212
Arnaud's case of a hernia of the cæcum, complicated with adhesions and gangrene 214
Of the treatment of hernia of the cæcum when complicated with adhesions and gangrene 216
Diagnostic symptoms of hernia of the cæcum 218
Of the effect of the loss of a portion of the cæcum from gangrene 222
Of the ligature of the omentum 224
Mr. Cooper's mode of removing the omentum—*Note* 229
Of collection of water in the hernial sac, and of hydrocele considered as complications of Scrotal Hernia 230

MEMOIR THIRD.

OF FEMORAL HERNIA IN THE MALE.

Object of this Memoir 235
Description of femoral hernia 239
Diagnostic symptoms of femoral hernia 243
Of the compact subcutaneous cellular membrane forming the second covering of femoral hernia 247
Of the proper cellular sheath or fascia propria of Mr. Cooper 249
Of the true hernial sac 251
Of the relative situation of the epigastric artery with the neck of femoral hernia in the male 254

Page

Of the situation of the spermatic artery and veins, with regard to the neck of femoral hernia 256
Of the formation of femoral hernia 257
Difficulty of avoiding the spermatic artery in the division of the femoral arch 260
Of the means proposed by various authors to prevent hemorrhage, and to guard these arteries from injury 266
Of the division of the aponeurosis of the fascia-lata 267
Of the mode of employing Arnaud's hook 271
Mr. Bell's mode of dividing the femoral arch 271
Of Leblanc's dilator 273
Of strangulated femoral hernia, complicated with fleshy adhesion 276
Of the direction to be given to the division of the femoral arch, and neck of the hernial sac, in order to avoid wounding the epigastric and spermatic arteries 277
Of the division of the stricture, when the strangulated hernia is complicated with fleshy adhesion to the neck of the hernial sac 281
Of the situation of the round ligament of the womb in femoral hernia 283
Of the most proper bandage for femoral hernia 285

MEMOIR FOURTH.

OF GANGRENED HERNIA, AND OF THE MEANS WHICH NATURE EMPLOYS FOR RE-ESTABLISHING THE CONTINUITY OF THE INTESTINAL CANAL.

Of the causes of gangrene in hernia 288
Of the *acute*, or chronic strangulation 290
Of the proper time of performing the operation 292
Of the difference between incarceration and strangulation 295

Page
Of the cure of artificial anus 298
Of the means employed by Nature to effect this cure 300
First case 300
Description of the parts which formed the communication between the two extremities of the divided intestine 302
Second case 305
Third case 308
Experiments on the dead body, in support of the preceding cases 311
Formation of the membranous funnel, which forms the communication between the orifices of the divided intestine 312
Causes which may facilitate or retard the re-establishment of the continuity of the intestinal canal 315
Necessity of the funnel-shaped membranous passage, to supply the want of the intestine which has been destroyed by the gangrene 317
Comparison of the artificial anus, which is the consequence of a gangrened hernia, with that which is the consequence of a penetrating wound of the abdomen 319
Of the ligature of the mesentery 322
Mr. Travers' observations on this subject—*Note* 323
Comparison of wounds of the intestinal canal, with those of other parts of the body 325
Disadvantages of a too low diet, in the treatment of artificial anus 327
Necessity of a nourishing diet, in order to assist the efforts of nature, in re-establishing the continuity of the intestinal canal 329
Cases in support of this precept 331
Precautions on the part of the Surgeon with regard to the cure of artificial anus 335

Page

Of the inversion of the intestine in cases of artificial anus 338

Of the state of the patient, from premature contraction of the intermediate cavity between the two orifices of the divided intestine 342

Of abscesses, and of fistulæ which form in the vicinity of the artificial anus, in consequence of its premature contraction 347

Of different means which have been proposed to re-unite the divided intestine 351

Of the treatment of protruded wounded intestine 355

Case of rupture of intestine in an inguinal hernia 361

MEMOIR FIFTH.

OF UMBILICAL HERNIA, AND OF HERNIA OF THE LINEA ALBA OF THE ABDOMEN.

Description of the *linea alba*, and of the umbilical ring in the fetus 368

State of the umbilical ring a few months after birth 371

Situation of the umbilical ligaments, and of the urachus with regard to the cicatrix of the umbilicus 372

Division of umbilical hernia into congenital and adventitious 374

Of the causes of congenital umbilical hernia 378

Of adventitious umbilical hernia 380

Dr. Abercrombie's case of umbilical hernia.—*Note* 383

Causes of umbilical hernia occurring after birth 386

Of the irregular shape of umbilical hernia 387

Of hernia of the *linea alba* 388

General description of hernia of the *linea alba* 390

Mode of distinguishing proper umbilical hernia, from that which forms in the *linea alba* contiguous to the umbilical ring 391

Of fatty tumors of the *linea alba* resembling omental hernia 392

Page

Comparison of proper umbilical hernia with that of the *linea alba*, in regard to the symptoms and treatment 396
Of the treatment of umbilical hernia in infants 397
Of the proper bandage for young infants 397
Of the mode of adapting it to older children 399
Of the cure of umbilical hernia by the ligature 399
Of the danger of that operation 401
Paletta's remarks on the danger of the ligature 401
Compression alone sufficient for the cure 404
Of the proper bandage for adults 405
Description of a cheap bandage 405
Of the spring truss for adults 406
Of the form of the pad 408
Of the corsets used for herniæ of the *linea alba*, near to the ensiform cartilage 409
Of the means for retaining omental herniæ 410
Arnaud's bandage for that purpose 411
Of the suspensory of Hildanus 413
Of strangulated umbilical hernia 414
Mode of operating in large irreducible herniæ 416
Mode of dividing the neck of the sac and ring 419
Treatment of the omentum when adherent to the sac 420
Of gangrened umbilical hernia 420
Case successfully treated by the Author 422
Amyand's cases of cure after gangrene 424
Teichmayer's case 427
The Author's cases describing the mode of union of the intestine in these cases 428
Chamery-Havé's case of mortified hernia 433
Remarks on this case, and on *invaginating* the gut 439
Case of spontaneous rupture of one of the mesenteric veins 441

Page

APPENDIX.

Definition of hernia 451
Different names given to herniæ from their contents, situation, and the state in which they occur 452
General diagnosis of hernia 454
Diagnosis of inguinal hernia 457
Of the taxis 461
Of the operation for inguinal and scrotal hernia 481
Of the treatment after the operation 484
Of femoral hernia 486
Of the diagnosis of femoral hernia 491
Of hernia of the perineum, of the foramen obturatorium, of the vagina, and of the sacro-sciatic notch 492
Of hernia of the urinary bladder 502
M. Cayol's cases of mortification, occurring in an intussuscepted portion of intestine in hernia 513

Explanation of the Plates 519

THE

AUTHOR'S PREFACE.

The brilliant progress which Surgery has made in modern times, is in reality to be ascribed to anatomico-pathological observations, derived from exact comparisons of the natural structure and action of the parts of our body with their morbid state, from alteration of texture, change of action, interruption of continuity, or change of situation. From these results, as from so many corollaries, are deduced the most rational methods of cure, with which modern surgery has been enriched, and to these we are likewise indebted for the perfection of the manual operations.

There are, indeed, a number of surgical operations, for the quick and safe performance of which, a knowledge purely anatomical is sufficient; but there are many others, for the success of which the surgeon requires, in addition to anatomical knowledge, the information derived from the careful examination, in the dead body, of the numerous alterations which in various ways occasion a change or modification of the texture and position of the parts on which he is to operate, in order to avoid those errors, sometimes very great and irreparable, into which he might be easily led by trusting to appearances.

A very convincing proof of this truth, among the many of this kind which might be adduced, may be drawn from the consideration of the different species and various complications of hernia. And undoubtedly it would almost exceed the belief of any mere anatomist, that the cæcum, with its appendix connected to the right side, or the urinary bladder situated in the bottom of the pelvis, could suffer, without laceration, such a degree of displacement from their natural situation, as to pass out by the inguinal ring, and descend into the scrotum; that the cæcum, removed from

the right iliac region, should be protruded out of the natural parietes of the abdomen, through the umbilical opening, to form umbilical hernia; that the right portion of the colon should make its way out of the abdomen by the left groin, and the left portion of the colon by the right groin; that the liver, the spleen, the ovaria, should sometimes be the parts contained in umbilical, inguinal, or femoral hernia; that the cæcum could pass into the colon so as to be expelled by the anus; the stomach pushed so much upwards through the diaphragm, as to form a hernia within the thorax; that the omentum or intestine could ever find a passage out of the abdomen by the foramen ovale of the pelvis, or the sacro-schiatic notch; that a natural congenital appendix of the small intestinal canal, should descend to form a hernia in the groin, or under the femoral arch, without at all intercepting the passage and continuity of the intestinal canal, even under the most violent strangulation; lastly, that the intestine or omentum should very frequently be in immediate contact with the testicle within the vaginal coat, without any previous laceration of that coat. These and several other

similar phenomena, would be considered by the anatomist and physiologist as incredible, if the numerous observations made on the dead bodies of individuals affected with hernia, had not repeatedly proved the possibility of such remarkable changes of situation.

There can be no doubt that the antient surgeons, from the deficiency rather of pathological observations, than of anatomical knowledge, had only very limited and imperfect, or completely false ideas, with regard to the nature of hernia; and therefore, of necessity, their methods of cure could not fail to be imperfect and quite erroneous. For example, they were sufficiently well acquainted with the different coats which cover the testicle, but they were unable to determine precisely, in inguinal hernia, in what manner and between what coats the intestine or omentum descended, and they did not know the relations of situation and union of these viscera with the spermatic chord, and hernial sac properly so called. In such a state of uncertainty, and in the doubt which they entertained of being able to preserve the spermatic chord and testicle, they only undertook the cure of inguinal hernia by means of the liga-

ture, cautery, or castration; and while they employed this rough treatment for curing reducible inguinal hernia, they allowed those to perish without assistance in whom the hernia became incarcerated. The increasing number of pathological observations on this subject made on the dead body, has taught us the true relations between the inguinal ring and the hernial sac, between the sac and the viscera contained in it, as well as between the proper and common coverings of the testicle and spermatic chord, and therefore, by a happy change of circumstances, has taught us to substitute for castration, in the cure of inguinal hernia not incarcerated, a mild and purely mechanical method, viz. the bandage, and to reserve the operation only for those extreme and alarming cases in which the protruded viscera are strangulated, and not reducible into the abdomen in any other way but by the incision of the tumor, and this so well directed and circumscribed, as to leave the spermatic chord and corresponding testicle uninjured.

In spite of so great and conspicuous a progress in the theory and practical treatment of hernia, we cannot however say that every part of this

important subject has been illustrated with equal success. In Surgery, as in all the other sciences and arts which have for their basis observation and experience, there remains for a long time a degree of obscurity on some points, to dissipate which it is necessary to have recourse repeatedly to the same kind of observations and experiments, varying them in many different ways. It is from this continual zeal of perfecting our knowledge by means of accurate investigations, and repeated comparisons, that we are enabled to explain several minute circumstances, which have either escaped the attention of observers, or have been neglected, from being supposed less important to be known, but which in fact contribute very much to diffuse demonstration and proof over every branch of science and art.

This has happened precisely in the doctrine of hernia, especially of that of the groin and scrotum. I have been induced to believe, that several apparently minute circumstances, capable of illustrating the true nature of this disease, have been overlooked in its pathological description, from the consideration of the obscure and indeterminate expressions, by which the most celebrated

writers on these subjects point out the different layers, under which the viscera protruded into the groin or scrotum are situated; from their uncertainty with regard to the number and density of these coverings, according as the inguinal hernia is small and recent, or large and of long standing; from the various opinions with regard to the possibility or impossibility of the spermatic chord being sometimes situated on the anterior surface of the sac; from the silence with regard to the principal causes why the epigastric artery, which in the greater number of cases changes its position with respect to the hernial sac and inguinal ring, in some other cases remains in its natural situation; from the causes of certain adhesions of the intestine to the hernial sac, which attachment is, properly speaking, not at all morbid, although it has very much the appearance of being so; and from several other circumstances imperfectly known, or not sufficiently demonstrated.

The elucidation of these and several similar points, depended entirely upon a new and strict anatomical investigation of the dead bodies of hernial patients. In prosecuting this subject, I have remarked, that besides the chasms which

exist in the pathological history of inguinal hernia, the plates likewise representing this disease, are not sufficient to give to the young student a perfectly precise and accurate idea of this disease, and still less to unfold to him a clear and distinct representation of its different complications. Therefore, in giving the description of inguinal hernia, drawn from my observations on the dead body, I have thought it not less useful than necessary for understanding the description of it, to add plates, representing the parts affected, of the natural size, and showing their relations with the contiguous parts. At a time when the art of drawing is constantly engaged in publishing the riches of Zoology, of Botany, and of Zootomy, there will be no sensible and intelligent person, I hope, who will not approve of this sublime art co-operating for the advancement of pathology, which is closely connected with the means of preserving the health and life of man.

In the construction of these plates, I have begun by delineating the *simple common* scrotal hernia, that it might serve as a point of comparison for explaining more fully the *congenital* and *complicated* scrotal hernia, and at the same time point

out to the young surgeon the way which he ought to follow in laying bare speedily and safely the protruded and strangulated viscera. I have afterwards represented, if not all, at least the principal species of complication of scrotal hernia, both as far as regards the various immediate causes of strangulation of the protruded viscera, and the different kinds of morbid adhesion of the viscera with each other, and with the hernial sac. Persons skilled in the practical treatment of hernia, know that the difficulties and danger of the operation for strangulated hernia, are in proportion to the complications which exasperate the disease, because they stop the course of the operation, and perplex and embarrass the young practitioner. Every book of surgery indeed mentions the different immediate causes of strangulation of the viscera, and the different kinds of adhesion of the viscera to each other and to the hernial sac; but every skilful surgeon knows, from his own experience, that the simple and mere description of similar subjects, without the inspection of them on the dead body of a person affected with hernia, or of plates carefully drawn, is not sufficient to impress on the minds of young

students, clear and precise ideas with regard to the proper and distinctive characters of each of these complications, and make them appreciate the means, which experience has shown to be the most speedy and safe hitherto proposed to be employed in similar urgent circumstances. In my opinion, it is the more necessary that young surgeons should be possessed of such accurate knowledge, before beginning to follow the practice in large hospitals, as even under the direction of the best masters, in the midst of blood and the fingers of the operator, the pupils can rarely have sufficient opportunity of seeing and examining the species of complication, and the nature of the obstacle which opposes the replacement of the viscera in the abdomen.

Several difficulties of this kind are common to the inguinal and femoral hernia in both sexes. But in the male there is, in addition, the danger of fatal haemorrhage in the act of operating for femoral hernia, less from the wounding of the epigastric artery than of the spermatic artery, which unfortunately is always included in the division of the femoral arch, although it is generally practised with success in the female.

On this subject, I have in vain sought for among the best writers of surgery, including Arnaud, a plate giving a perfectly accurate idea of the proper and relative position of these arteries with regard to the neck of the sac of the femoral hernia, and capable of affording students of the practice of surgery information and necessary directions how to avoid so great a misfortune, in the case of operating on strangulated femoral hernia in the male. I flatter myself with having supplied this deficiency, by means of a plate intended solely for this purpose, and subjoined to the third memoir.

I have not neglected the examination, in the dead body, of the umbilical hernia, and of the hernia of the *linea alba.* In doing this, I have followed step by step the changes, to which in the natural state the aponeurotic aperture of the umbilicus is subjected in the embryo, in the mature fetus, in the infant, and in the adult, in order to determine as much as possible, the principal causes, both predisposing and proximate, of this hernia, which is sometimes *congenital,* sometimes *adventitious.* I have also investigated the difference which exists between this hernia and that

of the *linea alba*, and what dependence is to be placed on the preservative and curative means of this disease in its different stages.

In hernia, the gangrene of the strangulated intestine occasions the fæcal fistula and the *artificial anus*. Notwithstanding so great a derangement as the loss of a portion, sometimes very considerable, of the intestinal canal, it is well known to all surgeons, that Nature, very often by her own powers alone, succeeds in re-establishing the continuity of the alimentary canal. From what I find written with regard to this surprising phenomenon, it has appeared to me, that hitherto an exact account has not been given of the very simple, and in fact peculiar means, which Nature employs for effecting the cure of this loathsome disease. The inspection of the dead bodies of those in which this curative process had partially or wholly taken place, has informed me with respect to this important subject, and I have treated of it at length, because it appeared to me to throw some light on the phenomena of animal life, and likewise, because it has an immediate influence on the plan of cure of this and other analogous diseases.

Lastly, with regard to the construction of trusses for inguinal, femoral, or umbilical hernia, I have explained, with as much distinctness as possible, the ideas which I have acquired from dissection, from mechanics, and from the frequent application of these bandages, in order to bring them to a greater degree of perfection than they have hitherto attained.

I regret much that I have not been able to extend my investigations likewise to the pathology of the *rare* herniæ, as they are called, such as those of the *foramen ovale*, of the *sacro-schiatic* notch, of the perinæum, and of the vagina. As I am not at the head of a crowded hospital, I have had few opportunities of examining these diseases; this has been hitherto an unsurmountable obstacle to my undertaking, which I foresee cannot be accomplished, but by means of the combined observations of many individuals of the profession, who unite to a very extensive practice, the opportunity of making examinations on the dead body, and the true desire of bringing to perfection this very important branch of Surgery.

A

TREATISE ON HERNIA.

MEMOIR FIRST.

OF INGUINAL AND SCROTAL HERNIA.

§ 1. Arnaud, one of the most learned and celebrated surgeons who treats of the theory and practice of curing hernia, expresses his wish that he might be able to finish a work (*a*) which he had begun, with regard to the changes to which the parts concerned in the formation of hernia in general are subject; because he firmly believed, and

(*a*) Mém. de chirurg. T. 11. Appendix, pag. 9. Je voudrois être en état de finir l'ouvrage, que j'ai commencé sur les dérangemens qui surviennent aux parties interessées dans les hernies. Je crois de très-bonne fois qu'il manque à la chirurgie.

in my opinion had good reason for believing, that the surgery of his time was defective, in clear and accurate pathological ideas with regard to this disease. The work to which this experienced surgeon alludes, was either not completed by him, or has never been published. Camper had intended, I suppose, to supply this want, and began by delineating some plates representing inguinal and scrotal hernia; but he likewise died before finishing his work. The plates just mentioned, have however been published by Soemmerring, (*b*). I doubt very much, whether these plates can be of essential advantage to young students, both because the parts which they represent, constituting the inguinal and scrotal hernia, being delineated in an insulated state, are not sufficiently in detail, to show the intimate relation which they have with each other, and with the neighbouring parts, and because they do not point out to the young surgeon those complications and varieties which frequently occur in the diagnosis and treatment of this disease. Several other pathological descriptions of scrotal hernia, accompanied with plates, have been published since those of Camper; but all of them, as far as I know, after his plan, and therefore, with the same imperfections. On which account, I think that the remarks of Arnaud may be justly repeated, even at the present time.

(*b*) Icones herniarum.

As a proof of this assertion, we may mention the anatomical and pathological description of inguinal hernia, given by Richter, in the treatise he has published, which surgeons generally agree, comprehends the most accurate and precise account of the knowledge which we possess on this subject. "The hernial sac," he observes, (*c*) "in "proportion as the inguinal hernia increases in "bulk, descends into the scrotum, and in the cel- "lular sheath of the cord, otherwise called the "vaginal coat. All the tumor called hernia, is "formed by the skin of the scrotum, by the cel- "lular substance, and the hernial sac. The tes- "ticle and the spermatic cord are always on the "outside * of the sac, the cord behind † the sac, "and the testicle at its posterior and inferior "part ‡." But if it is a fact, and there can can be no doubt of its truth, that the hernial sac formed by the peritoneum, descends within the cellular substance, which surrounds the spermatic cord, as it is allowed that the cellular substance of the cord, with the vaginal coat of the testicle, are in the natural state included in the sheath of the cremaster muscle, it follows of course, that the hernial sac, with the viscera protruded into the

(*c*) Traité des hernies, Chap. V. *Description exacte de l'hernie inguinale.*

* Peripheral Aspect. † Dorsad of.

‡ Dorsal and sacral aspect.

groin or scrotum, must be inclosed within the cremaster muscle, which is as much as to say, the cremaster muscle, with its aponeurosis, will constitute one of the principal coverings of the inguinal or scrotal hernia. Richter does not mention this very important fact of pathological anatomy, in his description of inguinal hernia which he calls *accurate*. This author does not inform us, if the hernial sac formed by the peritoneum, passes *denuded* into the cellular membrane surrounding the cord, or if it is preceded and accompanied by that soft and distendible cellular substance, which connects the great sac of the peritoneum to the muscular parietes of the abdomen; if the portion of peritoneum opposite to the inguinal ring, is always sufficient for the formation of the hernial sac, or if that portion of the great sac lining the ileo-lumbar region, is also sometimes drawn downwards; if the descent of the viscera from the abdominal cavity into the scrotum, always takes place in an oblique line from the side to the pubes, or if it sometimes occurs in the direction from the sacrum to the pubes, in the line of the lesser axis of the pelvis; if in old and large scrotal herniæ, the number of the layers or coverings, containing the viscera, is actually increased, compared with those of a small and recent scrotal hernia, and if this increase of coverings in hernia of long standing, ought to be referred to an increased density of the hernial sac, formed by the

peritoneum, or to some other cause; if the spermatic cord is always found at the posterior * part of the hernia, or sometimes at the one side of the sac, and even on its anterior surface †; a circumstance, which, in spite of positive observation, has been a subject of controversy; and, finally, from what cause the epigastric artery, which in the greater number of cases is found on the inner side ‡ of the neck of the hernial sac, sometimes retains its natural situation on the outer side || of the inguinal hernia.

These and several other questions which I might propose, to which we do not find a satisfactory answer in Richter's work, and in the other books which treat on this subject, justify me for undertaking this memoir. In doing this, I thought that I could not relate my observations with greater order and perspicuity, than by making an accurate comparison of the sound and diseased state of the parts concerned in the formation of inguinal hernia, a disease not less frequent than dangerous.

§ 2. In the healthy state, the aponeurosis of the *external* oblique muscle of the abdomen (*d*), attached anteriorly ** to the *linea alba*, and later-

* Dorsal. † Dermal aspect. ‡ Mesial. || Lateral aspect.

(*d*) Pl. 1. A. B. B.

** Sternad.

ally to the superior and anterior spine of the os ilium, increases, in density and elasticity, as it approaches to the lower* margin of the abdomen. For, a little below† the umbilicus, and more particularly about four finger's breadth from the femoral arch, and from the inguinal ring, the aponeurotic fibres of this muscle are much stronger, and thicker, than those which are observed above the umbilicus; and in the dead body, after the integuments are removed, and left for some hours exposed to the open air, the lower‡ portion of the aponeurosis of the *external* oblique appears opaque and dense, while the rest of the aponeurosis, in the vicinity of, and above the umbilicus, preserves its transparency, and allows the fleshy fibres of the subjacent abdominal muscles to be seen through it. At the distance of about an inch and an half from the os pubis, this more compact and elastic portion of the aponeurosis of the *external* oblique, divides into two parts, the superior§ one *(e)* is larger than the inferior‖ portion, and is inserted into the margin and upper** part of the os pubis, where it appears to form an intersection with that of the opposite side, and to intermix with the ligamentous substance connecting the ossa pubis together, from which substance

* Sacral. † Sacrad of. ‡ Sacral. § Atlantal.

(*e*) Pl. I. q. q. b. b.

‖ Sacral. ** Atlantal.

the suspensory ligament of the penis derives its origin *(f)*. The other portion of the aponeurosis of the *external* oblique, or the lower * portion, which is narrower, but denser and more elastic than the upper, runs obliquely from above downwards, and from behind forwards †, above ‡ the femoral fossa, of which it forms the *arch*, and is inserted by a firm tendon into the tubercle and spine of the top of the os pubis, where it is likewise lost in the ligamentous substance which unites these bones. By the divergence of these two portions, is formed that aperture called the inguinal ring, in an oblique direction from the side to the pubes; it is more of a triangular than elliptical form; in the male the spermatic cord, covered by the cremaster muscle, passes through it, and in the female, the round ligament of the uterus. In general, the aponeurosis of the external oblique muscle, seems to be formed by a series of small bands, disposed in so many parallel lines, running § from above downwards and from behind forwards, or in the same direction with the fleshy fibres of the external oblique; from which circumstance this aponeurosis has the appearance of a simple web. And this interweaving is observed in the whole extent of the aponeurosis, except at

(*f*) Pl. I. d.

* Sacral. † Sacrad, Mesiad, and Sternad. ‡ Dermad of.

§ Running Sacrad, Mesiad, and Sternad.

the place where it begins to diverge for the formation of the inguinal ring. At that place it has no longer the appearance of a mere web, but rather of a texture intersected by several other tendinous bands, crossing in a different direction from the first (*g*): the greater part of the latter are detached from the femoral arch, extend over the top of the inguinal ring, and are lost in the internal * side of that ring. This intersection of the tendinous fibres of the aponeurosis of the external oblique muscle, has some resemblance to the interweaving of the tendinous bands, which are observed in the aponeurosis of the diaphragm around the tendinous opening, through which the ascending vena cava passes. There can be no doubt, that the aponeurosis of the external oblique muscle, being denser and more elastic in the lower † region of the abdomen than in the upper ‡ one, being applied in the manner of a *belt*, acquires a still greater degree of density and elasticity in the vicinity of the lower § margin of the abdomen, and around the

(*g*) Pl. I. i. k. b. b. Pl. II. a. a. b. b. c. d. Camper, Tab. hern. tab. vi. 10; tab. ix. fig. 1. H. B. fig. xiii. § 24. His duobus tendinibus annulus firmatur, musculi fibris a se invicem divisis. Non tamen a se invicem dividuntur ut seorsim discurrant, aut facile vi adhibitâ disrumpantur. Fibræ aliæ, e contra, eas iterum connectunt, decussando primo descriptas; imo, in herniis, præsertim incarceratis, fibræ plane transversim perrepunt limbum efformantes.

* Mesial. † Sacral. ‡ Atlantal. § Sacral.

inguinal ring, than in any other place, from the additional covering and intersection of the above mentioned tendinous bands; of the use of which one would be led to say, that by means of them nature had intended to fix the limits of the inguinal ring, and to oppose the further divergence of the tendinous pillars towards the side *. Indeed, no other intersection of tendinous fibres similar to this, at least so far as regards the number and size of the bands, is met with in any other part of the aponeurosis of the external oblique muscle, nor in the subjacent aponeuroses of the internal oblique and tranverse muscles. Winslow thought (*h*) that the tendinous strips just mentioned, which he called *lateral*, do not exist in children; and following him, some authors have doubted whether a similar structure can be shewn in women. I can affirm that I have met with it in children, and in women whenever I have investigated it carefully.

§ 3. The aponeurosis of the external oblique muscle, for a certain space above † the femoral arch and inguinal ring, is covered by a fine layer of the aponeurotic web of the muscle of the fascia lata, one part of which layer is extended upon the ring over the cremaster muscle, which it ac-

(*h*) Traité des muscles, No. 84.

* Lateral aspect. † Atlantad of.

companies into the scrotum, where it is intermixed and lost in the cellular substance which unites the external surface * of the cremaster with the *dartos :* the other portion is stretched towards the side. In the vicinity of the inguinal ring, this aponeurotic expansion of the fascia lata is so transparent, that the fleshy fibres of the cremaster muscle are seen behind it, and in part also the spermatic cord. It can be completely separated from the aponeurosis of the external oblique muscle every where, except in two distinct places, viz. along the arch, and close to the pillar of the inguinal ring, to which parts it is found to adhere very closely. Therefore this aponeurosis of the facia-lata, must add strength and elasticity to the femoral arch and inguinal ring. In fact, in the dead body, on cutting this aponeurotic membrane in the vicinity of the Fallopian ligament, parallel to this ligament, the femoral arch is as it were spontaneously opened and raised, and on dividing the same aponeurotic membrane close to the edge of the inguinal ring, this aperture resists less than before the dilatation made by introducing the finger from without inwards.

§ 4. The internal oblique muscle of the abdomen attached firmly to the internal † margin of the crest of the os ilium, and its anterior and su-

* Peripheral. aspect. † Central.

perior spine, as also to the beginning of the Fallopian ligament, changes the direction of its lower * fibres, from an oblique line from below upwards into a transverse direction, and extends its fleshy bundles close to the superior angle of the inguinal ring. The aponeurosis of this muscle passes over † the rectus muscle, and is inserted into the linea alba. A little lower ‡ than the ring, it is attached to the spine and upper part of the os pubis, immediately behind § the insertion of the two tendinous pillars, between which the ring is situated. Towards the side, at about eight lines distance from the apex of the ring, the lower ¶ muscular fibres of the internal oblique muscle separate from each other, to allow the spermatic cord to pass between them. The external ‖ bundle of fleshy fibres formed by this separation, is firmly attached for a certain space to the ligament of Fallopius, and there constitutes the principal origin of the cremaster muscle; I call it the principal origin, because in some subjects, the cremaster has a second origin less than the first, from some muscular fibres which arise from the os pubis, in the vicinity of the insertion of the superior ** pillar of the ring. These last mention-

* Sacral, from a direction obliquely atlantad into one that is transverse.

† Peripherad of. ‡ Sacrad of. § Dorsad of. ¶ Sacral.

‖ Atlantal. ** Atlantal.

ed fibres, when they exist, appear very distinctly on dividing the inguinal ring, and turning back upon the abdomen the testicle with the spermatic cord. The principal origin of the cremaster muscle, derived from the lower * fleshy fibres of the internal oblique muscle, immediately after its attachment to the Fallopian ligament, is spread over the outer side † of the spermatic cord, while the other smaller portion of this muscle, when it is found, passes on the inner ‡ side and anterior surface of the cord, and both of them descending, accompany and surround the spermatic vessels through the ring into the scrotum.

On the outside § of the ring, both the larger (*i*) and the smaller (*k*) portion of the cremaster muscle, spread their fleshy serpentine fibres in various directions, and form different intersections, until they all terminate in the tendino-membranous aponeurosis of this muscle, which, in the manner of a sheath (*l*), includes within it the spermatic cord, with the cellular substance surrounding it, along with the vaginal coat of the testicle.

§ 5. The transverse muscle, (*m*) situated under the internal oblique, is attached likewise to the

* Sacral. † Lateral and sternal aspect.

‡ Mesial and sternal. § Dermad of.

(*i*) Plate I. ggg. (*k*) Id. f. (*l*) Id. h. (*m*) Id. c.

internal * margin of the crest and anterior spine of the os ilium; its fleshy fibres do not descend so low †, and so near to the Fallopian ligament, as those of the internal oblique. Its lower fibres are not separated by any body passing through them. For the spermatic cord, in its passage through the muscular parietes of the abdomen, does not pass through a separation of the lower ‡ fleshy fibres of the transverse muscle, as that formed in the *internal* oblique, from which, as has been mentioned, the cremaster muscle arises, but only passes under § the inferior fleshy margin of the transverse muscle. The exact place of the passage of the spermatic cord under the transverse muscle, is about an inch farther backwards ¶, towards the lumbar region, than the usual situation of the separation of the lower || fleshy fibres of the internal oblique, or the principal origin of the cremaster muscle. The aponeurosis of the transverse passes over** the rectus muscle, and is inserted into the *linea alba*, and a little lower †† than the inguinal ring, is attached to the pubes behind ‡‡ the insertion of the aponeurosis of the *internal* oblique. Although I have employed very great care, I have not been able to determine with certainty, whether the lower §§ thin fleshy margin

* Central. † Sacrad. ‡ Sacral. § Centrad of the margin.
¶ Dorsad. || More sacral. ** Peripherad of.
†† More sacrad. ‡‡ Dorsad of. §§ Sacral.

of the transverse muscle, contributes any fibres to the formation of the larger portion of the cremaster muscle. These lower * thin fleshy fibres of the transverse, are so firmly united to the lower † muscular fibres of the *internal* oblique, at their common attachment to the crest of the os ilium, and to the superior and anterior spine of that bone, that, at these points of union, I have not been able to distinguish the fibres of the one of these muscles from those of the other. However, it appears to me, that we may say, without risk of error, that, if the transverse at this common point of union with the *internal* oblique, furnishes any fleshy fibres to the formation of the greater portion of the cremaster, they are very few and very minute.

§ 6. This disposition of the muscular parietes of the abdomen, relative to the course of the spermatic cord, from behind ‡ the sac of the peritoneum, and from the loins to the inguinal ring, deserves the particular attention of anatomists, as well as of surgeons, in so far as the inguinal ring, on the side of the abdomen §, has opposed to it the two aponeuroses of the *internal* oblique, and of the transverse muscles, which, although thin in comparison with that of the *external* oblique, close the aperture of the ring towards the abdomen, and

* Sacral. † Sacral. ‡ Dorsad of.

§ Towards its central and atlantal aspect.

resist the direct impulse of the abdominal viscera against that aperture. Further, the passage of the spermatic cord, through the triple muscular covering of the abdomen, does not take place in the direction from the sacrum to the pubes, or of the lesser axis of the pelvis; because, as has been mentioned, that is prevented by these two aponeuroses, therefore it takes an oblique course from the spine of the ilium to the pubes. On which account, it is evident, that what is commonly called inguinal ring, is rather a canal, the internal* extremity of which corresponds to the place of the passage of the spermatic cord, under the lower † fleshy margin of the transverse muscle: the external ‡ to the inguinal ring, commonly so called. We observe also, that the spermatic cord passes through the abdominal muscles in succession, at three different places, which are not found to correspond in a direct line with each other. For the point where the spermatic cord passes under the fleshy margin of the transverse muscle, is about three inches from the pubes, and is the most deep-seated; that where it passes through the separation of the lower § fleshy fibres of the *internal* oblique, or between these fibres and the principal origin of the cremaster, is about two inches from the pubes, and at a smaller depth than the former; lastly, the place where the spermatic cord passes out of

* Central. † Sacral. ‡ Dermal. § More sacral.

the ring of the external oblique, is only about an inch from the pubes, and almost immediately under the integuments of the groin. On which account, it will perhaps not be difficult to reconcile the opposite doctrines with regard to the inguinal ring. The greater number of anatomists, seem to consider it as formed only by the aponeurosis of the *external* oblique; while others pretend that it is formed by all these three abdominal muscles (*n*). And unquestionably, if we only attend to the place where the spermatic cord passes out, in the groin, there can be no doubt, that what allows a passage to the cord out of the abdomen, is only the opening formed in the aponeurosis of the *external* oblique muscle; but if by the course of the spermatic cord from the loins to the groin be understood, as it ought to be, the course of about three inches which the cord takes from under the edge of the transverse muscle to the groin, we must allow, that what is commonly called inguinal ring, is, properly speaking, a canal inclined from the loins to the pubes, strengthened on * the fore part by the aponeurosis of the external oblique, and posteriorly † by the divergence of

(*n*) Schmit. comment. de nerv. lumb. § 47. A natura edoctus sum obliquum minorem et transversum abdominis in illa regione laciniis suis tendiniis ad annuli formationem aliquid conferre.

* Dermal aspect. † On the central aspect.

the lower * fleshy fibres of the *internal* oblique, and by the lower † margin of the transverse muscle, and by their respective aponeuroses, which descending lower ‡ than the inguinal ring, and being inserted into the pubes, prevent the direct communication of this aperture with the cavity of the abdomen. Albinus, in his tables of the muscles, has very accurately represented the course of the spermatic cord under the aponeurosis of the *external* oblique, and has likewise pointed out the length and direction of the canal of which we are speaking. Therefore, if we attend to the oblique but naturally open passage of the spermatic cord from the loins to the groin, and if we consider, that the aponeuroses of the *internal* oblique, and of the transverse muscles, although very thin opposite to the inguinal ring, and below it, at their insertion into the pubes render the internal side § of the ring, towards the *linea alba*, more solid and stronger than the course of the spermatic cord, under the fleshy margin of the transverse muscle to the ring, the reason will appear very evident, as shall be mentioned afterwards, why inguinal herniæ take place more frequently in the direction from the loins to the pubes, than from the sacrum to the pubes, according to the smaller diameter of the pelvis.

* Sacral. † Sacral. ‡ More sacrad.

§ Mesial extremity.

§ 7. The peritoneum is a fine membrane apparently diaphanous, but in fact abundantly supplied with blood vessels, and innumerable lymphatics, intermixed with each other in a manner not unlike to a very delicate net work, as is demonstrated by fine injections, and confirmed by the quick absorption and progress of coloured liquids, when poured on purpose into the cavity of the abdomen of animals. By the action of stimuli applied to this membrane, such as the air, effused blood, urine, fæces, the solution of continuity and the like, the peritoneum shews a singular disposition and readiness to inflame, and during the inflammation, to pour out a great quantity of coagulable lymph, in which state the peritoneum quickly contracts adhesions with the parts with which it is in contact. Farther, it is a phenomenon no less constant than worthy of reflection, that a portion of peritoneum not inflamed, placed in contact with another in an inflamed state, the latter is a sufficient cause why the first becomes likewise inflamed, and acquires the necessary disposition for forming adhesions to the contiguous portion. If this facility in the peritoneum to become inflamed, and to form adhesions with the parts contained within the cavity of the abdomen, and covered by the same membrane, readily occasions on the one hand severe and dangerous accidents, on the other, it constitutes one of the most effectual means, which na-

ture and art possess, for repairing very severe injuries, which would otherwise arise from wounds of the abdominal viscera, especially of the intestinal canal, in consequence of external wounds, or of incarcerated and gangrened hernia. For by what other means could wounds of the abdomen, with injury of the viscera, those of the intestines beyond the reach of the hand of the surgeon, those of several convolutions of intestine, perforated by a ball having passed through the abdomen, or the loss of a gangrened portion of the intestinal canal, be cured without effusion of blood and fæces into the cavity of the abdomen?

The peritoneum, in spite of its thinness, is capable of resisting a very considerable distending force, without being ruptured, or losing its natural elasticity. Experience has shewn me, that a large circle of this membrane recently taken from the dead body, and stretched upon a hoop like a drum, was capable of supporting a weight of fifteen pounds without being ruptured, and on removing the weight, it returned almost to the position it had before: it was not till after the pressure was continued for a long time, and gradually increased, that this membrane lost its natural elasticity, and was formed into a sac. But setting aside such sort of experiments and proofs, the pathological facts are already sufficiently well known and numerous, which clearly demonstrate, that the abdominal muscles, with their aponeuroses, would

not be sufficient to contain the viscera of the abdomen in their natural and exact situation, without the addition of the elastic sac formed by the peritoneum.

§ 8. The peritoneum, however, is not equally compact and elastic in all the regions of the abdomen; and in every part of the circumference of the abdomen, this membraneous sac is not equally covered and strengthened by the superjacent fleshy, and aponeurotic layers of the abdominal muscles. For the peritoneum is more firm and elastic in the loins, than at the sides, and on the anterior * surface of the abdomen, especially around the umbilicus, and in the vicinity of the ensiform cartilage, and along the *linea alba*. And with regard to the covering of the muscles, and of their aponeuroses, the peritoneum on the anterior † surface of the abdomen, from the ensiform cartilage downwards at the sides of the *linea alba*, a little lower than the umbilicus, is covered by a double aponeurosis, furnished by each of the two transverse and internal oblique muscles: these aponeuroses form the sheath which includes the rectus muscle on both sides. But this is not the case in that part of the abdomen, from a little below ‡ the umbilicus to the pubes, and from the superior spine of the ilium along the Fallopian

* Sternal aspect. † Sternal aspect. ‡ Sacrad of.

ligament to the pubes; because, from below * the umbilicus to the pubes, the rectus muscle has no aponeurotic sheath, and lies immediately upon the (*o*) peritoneum, and at the inferior † and lateral margin of the abdomen, from the superior spine of the ilium to the pubes, following the course of the spermatic cord, the peritoneum is not covered and strengthened by any other strong defence except the aponeurosis of the *external* oblique muscle, as those of the *internal* oblique and transverse are at that place very weak and thin. It is true indeed, that nature has providently thickened the aponeurosis of the external oblique at that place, more than at any other, and along the femoral arch it has rendered the inferior ‡ pillar of the inguinal ring thicker and more tendinous than the superior § pillar, and farther, it has firmly united the femoral arch to the aponeurotic web of the fascia lata. Notwithstanding this, observing the thinness of the aponeurosis of the internal oblique and transverse, there can be no doubt, that in the whole space through which the spermatic cord runs, from ‖ under the fleshy margin of the transverse muscle to the inguinal ring, the peritoneum is less covered and strengthened by fleshy

* Sacrad of.

(*o*) Plate I. 5. 5. and Plate II. n. n.

† Sacral. ‡ Sacral. § Atlantal. ‖ Sacrad of.

and aponeurotic layers, than in all the rest of the circumference of the abdomen.

§ 9. On examining the internal * part of the cavity of the abdomen, over against the iliac and inguinal regions, we find, that the great sac of the peritoneum forms two depressions, separated from each other by a partition formed by the elevation of the umbilical ligament, the umbilical artery in the fetus, together with the fold in the peritoneum which this ligament raises at the side of the urinary bladder, to keep it supported from the bottom of the pelvis to the umbilicus. Of these two depressions, the superior † towards the side is the deepest, and has in general a triangular shape, with its apex turned a little more downwards ‡ than the place at which, in the fetus, the testicle begins to descend from the abdomen into the groin, and where, in the adult, the spermatic cord passes under § the fleshy margin of the transverse muscle. The other smaller and inferior ‖ depression, situated on the inner ¶ side of the umbilical suspensory ligament of the bladder, corresponds nearly to the place in the groin, towards the pubes where the spermatic cord crosses the epigastric artery. Of these two fossæ, the supe-

* Central aspect of the abdominal cavity. † More atlantal.

‡ Sacrad. § Sacrad of. ‖ More sacral. ¶ Mesial.

rior * being larger and deeper than the inferior †, is that within which the intestines collect, when strongly compressed by the abdominal muscles, and by the diaphragm during a violent exertion; yet it is precisely at that place, as I shall afterwards shew, that inguinal hernia most frequently has its origin; the partition formed by the suspensory ligament of the bladder, and by the duplicature of the peritoneum, preventing the compressed viscera lodged in this fossa, from removing out of it to descend into the pelvis.

§ 10. The sac of the peritoneum is united externally to the muscular and aponeurotic parietes of the abdomen, by means of a soft cellular substance, capable of being distended very much without lacerating. This union of the external cellular substance of the peritoneum, with the aponeurosis of the abdominal muscles, is so flexible and yielding, that under certain circumstances, it allows the peritoneum to slide, to use the expression, upon the muscular and aponeurotic parietes of the abdomen, and therefore, to change its situation without occasioning a laceration of the cellular substance which keeps it united to the muscles and aponeuroses of the abdomen. The possibility of this transposition of the perito-

* More atlantal. † More sacral.

neum, without rupture of the surrounding cellular substance, is proved by the descent of the testicle, in the fetus, in which there can be no doubt, that the vaginal coat is formed by that part of the great sac of the peritoneum, which, before the descent of the testicle, was connected to the lumbar and iliac regions by means of cellular substance. This fact is also confirmed by some species of inguinal and scrotal herniæ, of which I shall have occasion to speak, in which the natural adhesion of the intestines to the great peritoneal sac within the abdomen, is transported from the iliac region into the scrotum, and is there observed to form a part of the hernial sac, without having been preceded by any rupture of the cellular membrane uniting, in the healthy state, that portion of the peritoneum to the muscular and aponeurotic parietes of the abdomen. This cellular substance, in similar circumstances, does not appear to have undergone any other change but that of elongation of its fibres, and to have yielded in such a manner as to follow the peritoneum in its various violent and unnatural changes of position.

§ 11. The cellular substance, which lying behind * the great sac of the peritoneum, surrounds the spermatic vessels, and accompanies them under†

* Peripherad of. † Sacrad of.

the fleshy margin of the transverse muscle, continues to encircle these vessels in their passage through the separation of the inferior * muscular fibres of the internal oblique, and along the inguinal canal, through the ring into the groin and scrotum, to the place where these vessels are inserted into the testicle. This cellular sheath, the continuation of that which connects the great sac of the peritoneum to the muscular and aponeurotic parietes of the abdomen, the nearer it approaches to the passage of the spermatic vessels out of the inguinal ring, becomes thicker and more puffy, and having passed through the inguinal ring, is found inclosed along with the spermatic vessels and the vaginal coat of the testicle, in the muscular and aponeurotic sheath of the cremaster muscle, which extends to the bottom of the scrotum. On making a small perforation in the upper part of this sheath of the cremaster, and forcing air into the cellular substance surrounding the spermatic cord, this cellular sheath is readily distended, and is raised in the form of a large cylinder, which extends downwards † through the groin into the scrotum, as far as the point of insertion of the spermatic vessels into the testicle, at which point, a depression or circular furrow is observed, marking the limits between the cellular substance of the cord, and the vaginal coat of the testicle. During this state of

* More sacral. † Distad.

artificial distension of the cellular substance, surrounding the spermatic vessels, if the sheath of the cremaster muscle be divided, with the hand unsupported, the cellular substance surrounding the spermatic cord appears denuded, and is observed to be composed of large and long cells, resembling a spongy vesicular substance, readily yielding and distendible, without laceration, through which the spermatic vessels appear separated from each other, and at the side of them is perceived that elongation of the peritoneum, which in the infant constituted the neck of the vaginal coat of the testicle. The facility of distension of the cellular substance, surrounding the spermatic vessels, is rendered likewise evident by the diffused hydrocele of the spermatic cord.

§ 12. The epigastric artery (*p*) ascends in the vicinity of the outer * side of the inguinal ring. This artery arises from the external iliac, near to the femoral arch, about an inch lower down than the place to which the convexity of the great sac of the peritoneum usually descends. The space between this convexity and the origin of this artery, is filled by the same cellular substance (*q*), which on the one side accompanies the spermatic cord out of the abdomen, on the other the large femoral ves-

(*p*) Plate I. 5. 6. 7. 8. 9.

* Lateral aspect.

(*q*) Plate II. q. Plate III. n.

sels. The epigastric artery is given off sometimes from the inner* side, sometimes from the anterior† surface of the external iliac artery, at a more or less acute angle with the trunk; it is hid behind ‡ the Fallopian ligament, and behind § the aponeurosis of the internal oblique and transverse muscles; then resting on the convexity of the great sac of the peritoneum (*r*), it ascends in an oblique line from the ilium towards the rectus muscle of the same side. In the course which this artery takes close to and behind ‖ the Fallopian ligament, it is crossed by the spermatic cord (*s*), a little before it enters the passage between the separation of the inferior ¶ fleshy fibres of the internal oblique and the origin of the cremaster muscle. At the place of this intersection, or a little below** it, the epigastric artery gives off a branch which is dispersed for the most part upon the cremaster

* Mesial. † Sternal. ‡ Dorsad. § Dorsad.

(*r*) Haller, Fasc. v. pag. 8. in writing *incumbit eadem arteria peritonæo primô, inde tendini transversi, et tendit introrsum versus rectum,* has not pointed out with precision the place where this artery rests upon the aponeurosis of the transverse and internal oblique muscles. This place is about two inches below the umbilicus. From this point downwards, the epigastric artery lies denuded upon the convexity of the sac of the peritoneum.

‖ Dorsad of.

(*s*) Plate X. 5. 11. 10.

¶ Sacral. ** Sacrad of.

muscle, and detaches one or two others which run between the aponeurosis of the *external* oblique, and of the *internal* oblique muscles, and are dispersed upon the cellular substance of the cord, and anastomose with the spermatic artery. The epigastric artery, lastly, resting, as has been said, upon the convexity of the great sac of the peritoneum, and kept there by the surrounding cellular substance, proceeds obliquely inwards * towards the rectus muscle, keeping at the distance of about eight or ten lines from the outer † side of the inguinal ring. The vein of the same name (*t*), arising from the external iliac vein a little lower ‡ than the origin of the artery, accompanies it, dividing into several branches, the principal of which keeps constantly on the inner § side of the artery.

§ 13. Thus far I have spoken of the natural conformation and position of the parts interested in inguinal and scrotal hernia. I now proceed to examine the changes which these parts present after the appearance of the hernia.

§ 14. Many of the most celebrated modern surgeons adopt the doctrine of Warton (*u*), Bene-

* Mesiad and atlantad.

† Lateral aspect.

(*t*) Plate I. and II.

‡ More sacrad.

§ Mesial.

(*u*) Adenograph, cap. xi.

voli (*v*), Roscius (*y*), Brendelius (*z*), and Morgagni (*a*), that the principal cause of hernia in general, and of the inguinal in particular, consists in the relaxation and elongation of the mesentery; in consequence of which, the whole mass of the intestines, or a part of them only, descends and presses constantly upon the inguinal ring, and at last succeeds in forçing a passage through this opening out of the abdomen. Benevoli added, that this relaxation of the mesentery is the effect of an extraordinary congestion of fluid, and principally of chyle in this membrane, without however giving a reason why the chyle, which runs through all the vessels of the mesentery, stagnates only in one division of this membranous support of the intestines, and relaxes only that portion of it corresponding with the hernia, while all the rest of the mesentery preserves its natural strength and tension. Whoever will examine, without prejudice, this point of pathology, will find that it cannot be a matter of controversy; that an intestine cannot be removed from its natural situation but in so far as it is permitted by the unnatural elongation of that portion of mesentery to which the protruded intestine is attached. But it does not result from this, as a necessary consequence, that the relaxation of a portion of the mesentery must precede the for-

(*v*) Dissertazioni chirurgiche, 1.
(*y*) Acta. Nat. Cur. T. 11. observ. 178.
(*z*) De Herniarum Natalibus.
(*a*) De sed. et caus. morb. Epist. 43. art. 13.

mation of the hernia, rather than that it should be simultaneous with its appearance. In a state of perfect health, there are two sets of forces, in equilibrium with each other, the one, the force of pressure of the abdominal viscera against the parietes of the abdomen, and the other of reaction of these parietes upon the contained viscera. If this reciprocity of forces were the same in all persons, and in all circumstances of life, herniæ would never occur; or if from disease the abdominal parietes always yielded equably at every point of the circumference of the abdomen to the impulse of the contained viscera, there would indeed be persons with enlarged bellies, but never affected with hernia properly so called. Although the liver, the spleen, and the stomach, are provided with ligaments, such means would be only a very weak support to retain these viscera in their situation, if there was not in addition to this a constant fullness, a continual pressure produced by the reciprocal action of the containing and contained parts of the abdomen, which causes every viscus to contribute to keep the contiguous one in its proper position. But there are some points of the circumference of the abdomen naturally less resistant than others, especially the space extending from the superior and anterior spine of the ilium to the pubes; these points are necessarily less capable than the others of reacting against the succussion, sometimes too violent, with which the compressed abdominal viscera are

forced outwards *. And these parts of the abdomen are in some individuals still less resistant than in others, on account of congenital relaxation or slenderness of make, or of many various external or internal debilitating causes. Whenever therefore the force of the pressure upon the viscera is unusually increased, or the natural resistance is much diminished in some point of the abdomen, which is as much as to say, when there is an alteration of the just equilibrium between the two orders of forces above mentioned, it must follow, from mechanical necessity, that the sum of the forces exercised by the abdominal muscles, by the diaphragm, and by the elevator muscles of the anus, will be directed and concentrated wholly towards the least resisting point of the abdomen, against which point that viscus will be pushed, which, from its vicinity or its mobility, is the most disposed to be thrust towards the least resisting place of the abdomen. If this viscus be a loop of intestine, it will necessarily follow that the concentration of the compressing muscular forces will act simultaneously upon the intestine, and upon the corresponding portion of mesentery, which portion of membrane will be similarly, and at the same time, relaxed and elongated in proportion as the intestine is protruded out † of the abdomen to form a hernia. In those cases in which the resistance of the abdominal parietes, to be overcome by the compressed viscera, is not very consider-

* Peripherad. † Peripherad.

able, as in congenital hernia, in which the hernial sac is already prepared for receiving the protruded gut, the loop of intestine quickly displaces and draws along with it the corresponding portion of mesentery. On the contrary, in the common inguinal hernia, from quite opposite reasons, this does not take place with equal facility, as in the congenital; and in general, on the first removal of the equilibrium between the above mentioned forces, there is not formed a hernia properly so called, but there appears only a slight fullness of the groin for a certain space, from the superior and anterior spine of the ilium towards the inguinal ring. When the protruded intestine has passed the inguinal ring, the stretching of the mesentery and increase of the hernia make rapid and simultaneous progress.

§ 15. It is a fact likewise proved by daily practical observations, that the principal cause of hernia is to be referred to the removal of the equilibrium between the just mentioned forces, and not to the preceding relaxation of the mesentery. For herniæ readily occur in children, in whom the neck of the vaginal coat of the testicle has not been quickly closed and obliterated. Those persons are readily exposed to this disease, who from being corpulent have afterwards become emaciated. Herniæ more frequently form in women who have had children than in the unmarried. They very frequently appear in those

persons who are employed in raising enormous weights, or play upon wind instruments, in those who have suffered violent contusions of the abdomen, in whom there has not been the smallest reason for suspecting that the hernia had been preceded by relaxation of a portion of the mesentery. The vaginal herniæ, which come on after laborious labours, prove the same truth, the principal cause of which herniæ is to be ascribed entirely to the diminished natural reaction of the vagina on the viscera situated in the lower part of the pelvis. And farther, in the formation of hernia, that the sum of the muscular forces pressing on the abdominal viscera, is wholly directed, or, to use the expression, concentrated towards the weak point of the circumference of the abdomen, is a fact proved by frequent and obvious observation: in persons affected with hernia, on the slightest attack of coughing or sneezing, they immediately feel their hernia swell, and instantly apply their hand in order to prevent its descent. And if, on the slightest attack of coughing, the intestine descends farther than before, this undoubtedly cannot take place without the portion of mesentery to which the intestine is attached partaking in the same protrusion, and suffering the same elongation along with the intestine. All the viscera of the abdomen have so great a tendency to be forced and directed towards the place of the abdomen, which has become the least resisting, that viscera have sometimes been found

in hernia, which, considering their natural situation and the number of their connections with the great sac of the peritoneum, no surgeon, from anatomical knowledge alone, would have ever suspected to be possible. Sandifort (*b*) and Palletta (*c*) found the cæcum, with a portion of the ileum and colon, in an umbilical hernia. Mauchart (*d*), Camper (*e*), Bose (*f*), met with the cæcum in an inguinal hernia of the left side. Lassus (*g*) found the left portion of the colon protruded through the right groin. If this shews the tendency which all the viscera of the abdomen, although firmly connected with the great sac of the peritoneum and to the neighbouring parts, have to yield, and to be transposed towards the place of the abdomen which has become the least resisting, and if, in order to effect such a transposition, it is necessary that the membranous ligaments retaining these viscera *in situ* be relaxed, can any one venture to deny that a free portion of intestine, pushed gradually into the canal of the inguinal ring, may not insensibly draw along with it that portion of mesentery to which it is attached, in proportion as it is pushed out of the abdomen, with-

(*b*) Observ. patholog. cap. iv.

(*c*) Nova gubernaculi testis descriptio.

(*d*) De Hern. incarc. *See* Haller disput. chirurg. T. iii.

(*e*) Demonstrat. anat. patholog. Lib. II. pag. 18.

(*f*) Animadvers. de Hern. Inguin. pag. 5.

(*g*) Médecine. Operat. T. 1. pag. 173.

out there being any occasion to have recourse to a preceding relaxation of a portion of mesentery, in order to explain this phenomenon?

§ 16. With regard to inguinal hernia, which forms the principal object of this memoir, I have said, that that portion of the abdomen, which extends from the superior and anterior spine of the ilium to the pubes, is naturally, and in the healthy state, the least resistant of all the other regions of the abdomen. I have the same remark to make also with regard to the membranous parietes of the abdomen, formed by the sac of the peritoneum, in all that space corresponding internally * to the inguinal region. For, as I have demonstrated that the peritoneum has absolutely no fleshy covering from the transverse muscle, at the point where the spermatic cord passes under † the fleshy margin of this muscle; and that the aponeuroses of the transverse and *internal* oblique muscles are very thin opposite to the inguinal region, and still thinner in the vicinity of the femoral arch and of the pubes; from this circumstance it follows, that the peritoneum in the inguinal region, is only supported and strengthened, in a certain degree, by the aponeurosis of the *external* oblique, and especially by the compact inferior ‡ pillar of the inguinal ring. And it

* On the central aspect. † Sacrad of. ‡ Sacral.

is precisely in this portion of the abdomen, and more particularly at the place where, in the fetus, the vaginal coat of the testicle opens into the cavity of the abdomen, and in the adult, the spermatic cord (*h*) passes under* the fleshy margin of the transverse, at the distance of about three inches from the pubes towards the ilium, that in most cases the peritoneum, forced onwards by the viscera strongly compressed, constitutes the first rudiments of the hernial sac, and of inguinal hernia; at which place there is observed, even in the healthy state, a small funnel-shaped depression of the peritoneum, which increases on drawing the spermatic cord outwards. This small sac or rudiment of the hernia, not unlike a thimble, when it makes its first appearance under† the fleshy margin of the transverse, rests immediately upon the anterior‡ surface of the spermatic cord; it then extends and passes in the middle of the separation formed by the divarication of the inferior§ fleshy fibres of the *internal* oblique, and of the principal origin of the cremaster muscle, and following constantly the course of the spermatic cord, on the anterior‖ surface of which it lies, it passes through an oblique canal from the side to the pubes, between the three great muscular and aponeurotic parietes of the abdomen, and more

(*h*) Albinus Tab. Muscul. tab. ii.

* Sacrad of. † Sacrad of. ‡ Sternal aspect.

§ More sacral. ‖ Sternal aspect.

particularly between the aponeuroses of the *external* and *internal* oblique, and at last reaches the inguinal ring commonly so called. In the course therefore which the hernial sac takes from the side to the pubes, it is never separated from the spermatic cord, and it passes immediately above * the femoral arch in a direction parallel to that arch. This canal is of a conical figure, having the base in the inguinal ring, and the apex towards the side.

§ 17. In the dead bodies of those who have had an incipient inguinal hernia, I have ascertained, by means of dissection, that the first rudiments of the hernial sac are formed very high up towards the side †, and, as has been said, precisely at the place where the spermatic cord passes under ‡ the fleshy margin of the transverse muscle, at the distance of about three inches from the pubes. I have also distinctly perceived, that the hernial sac from this place to the inguinal ring, passes through a canal supported posteriorly § by the thin aponeuroses of the *internal* oblique and transverse muscles, and anteriorly ‖ by that of the *external* oblique. If we pay a very little attention, the same thing

* Atlantad of.

† Considerably atlantad towards the lateral aspect.

‡ Sacrad of. § On the dorsal aspect.

‖ On the sternal aspect.

is likewise manifest in living persons affected with incipient inguinal hernia ; for in them a small oblong swelling is observed, situated in the bend of the groin parallel to the femoral arch, which swelling becomes sensibly enlarged, if the patient makes the smallest exertion in coughing, sneezing, or blowing his nose, and when an attempt is made to return it, the protruded viscera are evidently perceived to retire in an oblique direction from the pubes to the side. And this is still more evident in recent congenital hernia, complicated with adhesion of the viscera to the testicle ; for in the act of attempting the replacement of this hernia, the protruded viscera and the testicle, instead of passing into the abdomen in the direction from the pubes to the sacrum, return towards the side, in order to ascend to the orifice through which they had descended. And we cannot otherwise give a plausible explanation of the cases related by Mery (*i*) and Petit (*k*), with regard to some small inguinal herniæ, which, from causes not sufficiently known, had stopt beyond the ring under the aponeurosis of the external oblique, at which place they formed a cylindrical small tumour, extending from the inguinal ring towards the side, in the same direction with the bend of the thigh, and with that of the canal, improperly called inguinal ring.

(*i*) Mém. de L'Acad. R. de Paris, an. 1701.

(*k*) Petit Oeuvres posthum. T. ii. pag. 217.

§ 18. The hernial sac and the spermatic cord, on the first commencement of inguinal hernia under * the fleshy margin of the transverse muscle, are united together, as the peritoneum is naturally connected in the healthy state to the spermatic cord, by that soft cellular substance situated behind † the peritoneum, and connecting it to the muscular and aponeurotic parietes of the abdomen, in the ilio-lumbar and inguinal regions. This cellular union of the hernial sac with the spermatic cord, remains the same through the whole course of the hernia, from the fleshy edge of the transverse muscle to the bottom of the scrotum. For the force of the pressure of the protruded viscera, acting upon this cellular connection common to the hernial sac and spermatic cord, in consequence of its great flexibility and ductility, only causes its fibres to be insensibly more elongated, and to follow gradually the descent of the hernial sac, and of the spermatic cord, without suffering any laceration or detachment from the muscular parietes of the abdomen, to which it is originally connected.

Further, in the passage of the hernial sac, together with the spermatic cord, through the separation of the inferior ‡ fleshy fibres of the internal oblique, they are covered on the outer side by the principal fleshy origin of the cremaster muscle. After the hernial sac and cord have passed out of

* Sacrad of. † Peripherad of. ‡ Sacral.

the inguinal ring, from which passage the hernia cannot recede, on account of both of these parts being tied together by a common cellular substance, and because both of them are covered by the cremaster muscle (*l*), they proceed downwards* through the groin, where the fleshy bundles of the cremaster, with its aponeurosis, are converted into a sheath, which incloses within it the hernial sac, together with the spermatic cord and vaginal coat of the testicle, and, in the manner of a common muscular and aponeurotic sheath (*m*), surrounds and accompanies these parts to the bottom of the scrotum. And as the soft and extendible cellular substance, common to the hernial sac and spermatic cord, terminates at the place where the spermatic vessels are inserted into the testicle, it is precisely at this place that the descent of the hernia, and elongation of the cellular substance accompanying it, terminate, and there is evidently perceived at this place, principally in old and large scrotal hernia, a furrow of division between the bottom of the hernial sac and the testicle. The spermatic cord is of necessity situated behind † the hernia, both at its commencement and during the increase of the disease, for the reasons just mentioned, except in some cases, of which I shall speak in their proper place.

(*l*) Plate I. g. g. f. Plate II. e. e. g. g. f.

* Distad.

(*m*) Plate I. g. g. g. h. Plate II. g. g. f.

† Dorsad of.

§ 19. In old and large scrotal hernia, it is surprising to see how the fibres of the cremaster, which are naturally thin, enlarge so as to form bundles four or six times stronger than those which in the healthy state are spread over the spermatic cord. In some subjects, these fibres of the cremaster, distributed over the neck and body of the hernial sac, are unusually rigid and hard, and of a yellow colour. In spite of these appearances, which might lead to error, they may however be discovered to be fleshy fibres, and they have undoubtedly not imposed upon Haller (*n*). And this is not the only example of such changes of structure, as the same phenomena are presented in the state of morbid thickening of the fleshy fibres of the urinary bladder, of those of the stomach, of the intestines, and finally, of those fine fleshy filaments of the ligaments of the colon (*o*). In old scrotal hernia, we likewise not unfrequently see the fleshy fibres of the cremaster muscle firmly united to the edges of the inguinal ring. Whether this takes place in consequence of the long pressure occasioned by

(*n*) Opusc. Patholog. pag. 317. Saccus ipse hujus herniæ composita indole fuit: Super eum enim et in parte imprimis anteriori magna vis fibrarum disjectarum apparuit quam fabricam tendinosam ab aliis cl. viris vocari facile crediderim. Nihil tamen tendineum, et cremasteris potius sparsas fibras esse ex ipso pallore et directione apparuit.

(*o*) Taconi de rar. hern. quibusdam, tab. iii. fig. 2.

the continued increase of the hernia, or by this pressure, together with the adhesion of the fibres of this small muscle with the aponeurotic web of the fascia lata, extending from the edges of the ring downwards *, over the groin into the scrotum, it is a certain fact, that in large and old scrotal hernia, great difficulty is experienced in making the probe pass between the fleshy fibres of the cremaster and the margin of the inguinal ring, while it passes easily in recent hernia, and with equal facility as between the cremaster and hernial sac.

§ 20. Sharpe (*p*) and Monro primus (*q*), were the first among the few writers of surgery, who have made particular mention of this important pathological truth, relative to the different layers composing inguinal and scrotal hernia, that is, that the hernial sac derived from the peritoneum, together with the spermatic cord and the vaginal coat of the testicle, is found surrounded and inclosed within the cremaster muscle. Monro, indeed, doubted if this takes place constantly, and in every inguinal hernia: upon which point he had deceived himself very much, as it is one of the essential characters of this disease.

* Distad.

(*p*) Critical Inquiry, page 9.

(*q*) Anatomical and Chirurgical Works, page 553.

Petit (*r*) and Günz (*s*) have not failed to point out the relations which exist betwixt the cremaster muscle and the hernial sac. The first of these authors, after having noticed this fact, demonstrated, by a very interesting case, that the cremaster muscle, which surrounds and includes the hernial sac, may sometimes of itself alone be sufficient, by its contractions, to cause the return of the hernia. Günz has likewise given a sufficiently clear description with regard to the share which this muscle, with its aponeurosis, has in the formation of the different layers or capsules of the inguinal and scrotal hernia. Morgagni (*t*) also wrote, that he had observed in a hernial patient the fleshy fibres of the cremaster spread over the hernial sac, and Neubaver (*u*) mentioned distinctly that he had seen the same thing in the dead body of a man who had a hernia containing omentum and intestine. I cannot therefore comprehend why, in modern times, Pott, Richter, and many others among the later writers of surgery, have not mentioned, or not with sufficient clearness, this important point of the pathology of inguinal and scrotal hernia. Perhaps they have

(*r*) Œuvres Posthum. T. i. pag. 288.

(*s*) Günz libellus de herniis, p. 50.

(*t*) De sed. et caus. Morb. Epist. 34. Art. 9. Epist. 31. Art. 15.

(*u*) Dissert. de Epiploo-Oscheocele.

paid too much attention to the few incorrect plates of inguinal hernia published by Palfin (*v*), and by Mauchart (*w*), the first of whom did not even mention what that covering was within which he made the hernial sac be represented, and the second gave to the sheath of the cremaster, which he did not discover to be such, the name of *tunica aponeurotica*, as proceeding from the aponeurosis of the *external* oblique muscle of the abdomen; a very gross error, which was likewise committed by Walter (*x*). And this omission has not only been made by surgeons in the pathological history of inguinal hernia, but likewise in that of hydrocele of the vaginal coat of the testicle, in describing which disease, none of them, as far as I know, have even pointed out what part the cremaster muscle, with its aponeurotic sheath, has in the formation of this watery tumour, although the anatomical fact demonstrates that it has a very great share. For, this watery tumour is formed by two distinct sacs, the external* of which is the muscular and aponeurotic sheath of the cremaster muscle, and the internal† the proper

(*v*) See Heister Institut. Chirurg. T. ii. Tab. xv. Fig. iv.

(*w*) Dissert. de hern incarcer. See Haller Collect. Chirurg. T. iii.

(*x*) Nova Acta Erud. Lips. an 1738.

* Peripheral. † Central.

vaginal coat of the testicle. The first or external* covering, in a large and old hydrocele, is very thick and compact, while the internal†, formed by the vaginal coat, in most cases does not exceed the natural thickness and density of the peritoneum; on which account, in the act of operating, every attentive surgeon perceives, that before reaching the cavity containing the water, he divides two sacs distinct from each other in structure and density, and that they slide, to use the expression, the one upon the other.

§ 21. In small inguinal hernia, the difference begins to be very distinct which takes place between the natural position and direction of the collateral (*y*) tendinous bands, which intersect the descending parallel fibres of the aponeurosis of the *external* oblique muscle a little above‡ the inguinal ring, and that which the collateral bands assume after the appearance of the hernia without the margin of the inguinal ring.

In scrotal hernia of considerable size, the superior§ pillar of the inguinal ring is forced so much upwards‖ and forwards, that the collateral tendinous bands, and their intersections, approach each

* Peripheral. † Central.

(*y*) Plate I. a. a. b. b. k. k. i. i.

‡ Atlantad of. § Atlantal. ‖ Atlantad and Sternad.

other, and are gathered together, to use the expression, on the upper * part of the ring (z), and therefore give to the arch of the ring a degree of thickness and hardness much greater than that which it naturally has.

In proportion as the scrotal hernia increases in bulk, and as the inguinal ring enlarges, there is a proportional diminution of the length of the canal formed between the aponeuroses of the abdominal muscles, through which the spermatic cord with the hernial sac has descended, and there is a similar diminution of the oblique direction of the neck of the hernial sac from the side to the pubes; and, finally, in scrotal hernia of extraordinary size, this length and obliquity of the canal just mentioned, and of the neck of the hernial sac, disappear entirely, and the aperture of the inguinal ring communicates with the cavity of the abdomen almost in a straight direction from the pubes to the sacrum.

§ 22. It is a common doctrine in the schools of surgery, that in old scrotal hernia, the hernial sac formed by the peritoneum becomes very much thickened, and is converted into a compact dense membrane, which may however be resolved, as is asserted, into several membranous layers lying

* Atlantal.

(z) Plate II. a. a. b. b.

one over the other. I can assert, from numerous pathological observations which I have made on this subject, that in the greater number of cases of large and old hernia, the fact is in complete opposition with the common doctrine, and that generally the hernial sac, properly so called, is not at all or very little thickened beyond the natural thickness of the peritoneum, in any species whatever of scrotal hernia, although it be large and of long standing. The different density and hardness which are met with in dividing the coverings of scrotal hernia of different duration and size, are not in reality to be referred to the hernial sac formed by the peritoneum, but to the greater or less density and rigidity acquired in progress of time, and to the constant compression of the external * coverings of the hernia, such as the aponeurotic web of the fascia lata, the muscular and tendinous sheath of the cremaster muscle, and the external † cellular substance of the peritoneum, which surrounds and accompanies the hernial sac from within the abdomen to the bottom of the scrotum. This cellular covering in scrotal hernia of moderate size (*a*), preserves its natural softness and flexibility, and appears under the form of a soft spongy substance, interposed between the sheath of the cremaster and the hernial sac formed by the peritoneum. And it is precisely

(*a*) Plate II. h. h.

* Peripheral. † Peripheral.

on this account, that in scrotal hernia of moderate size, after dividing, with the hand unsupported, the sheath of the cremaster through its whole length, this soft cellular substance appears immediately under it, after which the peritoneum, forming the hernial sac (*b*), is seen shining through, the thickness and consistence of which do not at all, or very little, exceed that which the peritoneum naturally has in the cavity of the abdomen. On making an incision into a scrotal hernia of a large size and of long standing, we meet with, in the first place, the aponeurotic web of the fascia lata, and the sheath of the cremaster muscle unusually dense, rigid, and sometimes coriaceous, then the cellular substance, lying between the sheath of the cremaster and the hernial sac, presents itself so firm and indurated, that at first sight it appears to be a dense and compact capsule, formed of many layers, lying one over the other; lastly, under * an indeterminate number of these layers of hard cellular substance, the true hernial sac appears, the density of which, in spite of the excessive bulk and long standing of the hernia, does not at all or very little exceed the natural pellucidity and thinness of the peritoneum.

Whoever desires to prove the truth of this assertion by his own observations on the dead body affected with a large and old scrotal hernia, let him

(*b*) Plate II. h. h. and Plate 1. n.

* Centrad of.

make an incision through the inguinal ring and the aponeuroses of the abdominal muscles, until the convexity of the great sac of the peritoneum is laid bare, covered by the soft cellular substance which accompanies it out of the abdomen; then having raised the principal origin of the cremaster muscle, let him open the sheath of this muscle through its whole length to the bottom of the scrotum, and he will then clearly perceive that this soft cellular substance, accompanying the peritoneum through the inguinal ring, is interposed (*c*) between the sheath of the cremaster and the hernial sac, and that it is this cellular substance which,

(*c*) Plate II. h. h. In fat subjects, the cellular substance interposed between the hernial sac and the sheath of the cremaster muscle, is often interspersed with fatty layers, in the same manner as the cellular substance which connects the great sac of the peritoneum to the parietes of the abdomen, from which it is derived. In a scrotal hernia of long standing, I met with a fatty body, of two inches in length and one in breadth, between the sac and the sheath of the cremaster muscle. In another subject, I found between the hernial sac and the sheath of the cremaster muscle, so great a quantity of fat, that it passed through the inguinal ring, and was continued into the fat lying on the right side of the urinary bladder. On drawing down the fat situated between the cremaster and the hernial sac, the bladder, unusually enlarged in size, seemed disposed to pass through the inguinal ring towards the scrotum. In one dead body only, of a man affected with hernia, I found water collected in the cellular substance between the hernial sac and the sheath of the cremaster.

in old and large scrotal hernia, is converted into a firm and thick substance, apparently formed of many layers placed the one over* the other, under† which the hernial sac is situated, the density and thickness of which do not exceed that of the peritoneum in its natural state. Schmucker wrote (*d*), that he had found the hernial sac *thin* in a man who had had a large scrotal hernia for twenty years, as if it had been a very rare occurrence, although it is very frequent, as, according to the observations of Le Blanc *(e)*, and of many other celebrated surgeons, it is a certain fact, that in femoral hernia, which has no sheath from the cremaster muscle, the hernial sac is always thin, or does not at all exceed the natural thickness of the peritoneum, of however great size and long standing it may be.

From this, if I am not much mistaken, it may be inferred, that when a surgeon operates on a recent inguinal hernia, or on a scrotal hernia of moderate size, and immediately below ‡ the sheath of the cremaster muscle meets with the hernial sac of the proper thinness of the peritoneum, he has, without perceiving it, cut through the soft cellular substance situated between the sheath of the cremaster and hernial sac, and on the contrary, when he operates on a large and old scrotal

* Peripherad of. † Centrad of.

(*d*) Chirurg. Wahrnehm, 2 Th. p. 297.

(*e*) Précis. D'Operat. T. ii. p. 53.

‡ Centrad of.

hernia, he has divided, as a part of the hernial sac, the hard sheath of the cremaster, and the firm cellular substance interposed between this sheath and the true hernial sac.

This fact is not however so general, as not to admit of some exceptions. For the hernial sac sometimes acquires a greater density than that of the peritoneum from which it is derived, in those cases in which the hernia having been returned for a long time, has afterwards reappeared, and has not again been returned into the abdomen, or very irregularly; when the hernia has suffered repeated inflammatory attacks, and when there are extensive adhesions of the viscera to the hernial sac. I have several times dissected old scrotal herniæ, in which the omentum was adherent from the middle of the sac to the bottom, and I have observed, that the neck of the sac where no adhesion had taken place, was as thin as the peritoneum, while in proportion as the points of adhesion of the omentum to the sac increased, in descending, it acquired a greater thickness than usual, and at the bottom of the hernia was very thick.

§ 23. A question has been agitated amongst surgeons, and is still a subject of discussion, viz. the possibility or impossibility of returning the viscera into the abdomen, along with the hernial sac. In this controversy, as in many others of a similar description, it has happened, that in the heat of dispute, each of the parties, intent on

supporting his own opinion, has not been disposed to put a just value on that which was proved and demonstrated by accurate observation on this subject, to which alone, as the only certain rule of forming our opinion in similar cases, it is proper again to recur. And in the first place, there can be no doubt that cases have repeatedly occurred in practice, of small incarcerated herniæ, in which the intestine strangulated by the neck of the hernial sac has returned under the pressure made by the surgeon, and has drawn the hernial sac along with it within the ring. We have farther well authenticated histories of cases of intestine adhering to the hernial sac, and left * on the outside after the operation, which intestine, in spite of its attachment to the hernial sac, has been observed to rise up gradually towards † the ring, and consequently along with the hernial sac to which it was strongly adherent, and finally, to retire beyond the ring. Louis *(f)* has very improperly denied the possibility of these facts, which I know from my own, as well as from the experience of others, to be correct, and he has done so, as it would appear, merely because he had supposed and conceived, that the replacement of a hernial sac could never be effected by nature or art, without the rupture of the cellular substance, connecting the hernial sac to the

* Peripherad of the ring. † Atlantad of.

(*f*) Acad. R. de Chirurg. de Paris, T. xi. p. 486.

spermatic cord and to the neighbouring parts of the scrotum. In which assertion Louis has not considered, that the soft and extendible cellular substance of these parts, may, under certain circumstances, be elongated and shortened, without being ruptured. With regard to this fact, as I have mentioned above, there are many examples which might be adduced in proof of its possibility, drawn from observations of dislocated parts, of others greatly stretched, without rupture of the cellular substance connecting them to the neighbouring parts, and which, on the extending force ceasing, have resumed their natural situation. But not to wander from what I have assumed, it is a fact, proved by pathological observations, and by daily experience, that in inguinal hernia, not only the peritoneum, but likewise the spermatic cord is elongated, and descends farther into the scrotum than in the natural state. And this descent and elongation of the spermatic cord, unquestionably take place without any rupture of the cellular substance, which in the abdomen connected it to the lumbar region, and in the groin and scrotum to the hernial sac, and to the neighbouring parts. *Vice versa*, after the return of the hernia, the spermatic cord, with its cellular substance, gradually shortens and ascends upwards *, and as near to the inguinal ring as it was before the appearance and descent of the hernia. In like

* Atlantad.

manner, in large and heavy sarcocele, a very considerable portion of spermatic cord is drawn* to the external part of the ring, without any rupture of the cellular union of the cord in the loins and scrotum: afterwards on the sarcocele being removed, the portion of spermatic cord drawn without † the abdomen, rises spontaneously towards the inguinal ring, along with the cellular substance, and is even concealed behind ‡ the ring. In a similar manner, after the operation of incarcerated scrotal hernia, there is no surgeon who has not repeatedly observed, that the hernial sac advances daily nearer to the groin, and that it shortens and retracts. The cellular substance which accompanies the spermatic cord, from the lumbar region to the bottom of the scrotum, and that which unites the hernial sac to the spermatic cord, and to the contiguous parts of the groin and scrotum, have therefore the property of yielding to extension, and at the same time of shortening on the ceasing of the force which kept them extended and elongated; and if the cellular substance accompanying the spermatic cord has this property, why may not that which connects the hernial sac to the cord, to the sheath of the cremaster muscle, and to all the other adjacent parts of the scrotum and of the groin, possess a similar property?

There is no doubt, that in inguinal hernia, as long as it is small and recent, which is as much as

* Peripherad of. † Peripherad of. ‡ Dorsad of.

to say, as long as the cellular substance, accompanying the hernial sac and the spermatic cord through the ring, has not lost its natural elasticity and contractility, these parts will remain in such a state, as to be able to be pressed back towards the inguinal ring and even within that aperture. I observed this distinctly in the dead body of a man who had one of these small incipient inguinal herniæ, in which the hernial sac allowed itself, in fact, to be pushed up beyond * the inguinal ring, and on examining the parts carefully on the inner side † of the abdomen, as well as in the groin, it appeared that the stretched layers of the cellular substance, which united the hernial sac to the spermatic cord and to the sheath of the cremaster muscle, were disposed to yield both to the impulse of the protruded viscera, and to assist the retrocession of the hernial sac, forced by my fingers towards the cavity of the abdomen. Monteggia (*g*) met with a similar occurrence in a dead subject, in which, although the hernial sac, as he remarks, was not very small, yet it could be made to return completely, having very slight adhesions with the neighbouring parts.

It may however be said, that this, strictly speaking, is not a true replacement, but rather an accumulation of the parts beyond ‡ the ring, ready

* Atlantad of.

† On the central aspect of.

(*g*) Instituz. Chirurg. T. iii. sez. ii. pag. 249.

‡ Atlantad of.

to descend on the smallest exertion made by the patient; which is very true: but however this retrocession of the hernial sac, and of the viscera contained in it, may be defined, it is still a fact which cannot be called in question, that in small and incipient inguinal hernia, there is a possibility of returning through the inguinal ring, not only the protruded viscera, but also the sac of the peritoneum in which they are contained. This is not the case in scrotal hernia of large size, and of long standing, in which the cellular substance uniting the hernial sac to the spermatic cord, and both these parts to the sheath of the cremaster muscle, acquires such a degree of density and rigidity, as to resist not only the further descent of the viscera, but the hand of the surgeon who attempts to make it recede along with the hernial sac.

And this, in my opinion, puts an end to the controversy with regard to the possibility of this replacement. I shall have occasion to speak, in another place, whether it be proper to attempt this in cases of small, recent, incarcerated inguinal hernia, in which there are all the circumstances favourable for the return of the viscera into the abdomen, together with the hernial sac. I shall merely mention here, that reason and experience have pronounced in favour of the negative.

§ 24. As long as scrotal hernia is of moderate size, and the pressure exercised by the viscera contained in the hernial sac upon the cellular sub-

stance which unites it to the spermatic cord, is still moderate, the spermatic vessels and the vas deferens, which from the commencement of the hernia were enclosed in one common sheath, preserve the same form, and retain the same position relative to the hernia. On the tumor augmenting in size, as there is a proportional increase of the distension and compression caused by the hernial sac on the cellular substance, which encloses the spermatic vessels situated behind* the hernia, it happens that these vessels are separated, and therefore change their position with regard to the hernial sac. For in proportion as the hernia increases in size, the spermatic cord undergoes a kind of decomposition, just as if the cellular substance were drawn in two opposite directions. On which account, in a very large scrotal hernia, the spermatic artery (*i*), the vas deferens (*j*), and spermatic vein (*k*), are no longer found united in one cord behind † the sac, or between its posterior ‡ side and the sheath of the cremaster muscle, but are separated, and sometimes even removed at a considerable distance from each other. In general, the vas deferens is found less separated from the spermatic artery than from the veins. In some subjects, Camper (*l*)

* Dorsad of.

(*i*) Pl. III. 10. 11. 12.

(*j*) Idem, 13. 14.

(*k*) Idem 16. 17. 18.

† Dorsad of. ‡ Dorsal aspect.

(*l*) Icones Herniarum, Tab. v. L. O. Tab. viii. 1. 2.

has remarked that the vas deferens had been carried to one side of the hernial sac, while the artery and the veins were on the other. This decomposition and separation of the spermatic cord are common to adults, and to children affected with a very large scrotal hernia (*m*). In general, the greatest separation and displacement of these vessels take place towards the bottom of the hernia, less towards the middle, and still less in the vicinity of the neck of the sac and of the inguinal ring. In old and very large scrotal hernia, the bottom of the hernial sac advances so deeply between the spermatic vessels, that at last these vessels are no longer found situated behind* the sac, but on its sides, and latterly even on its anterior† surface, where although covered by the sheath of the cremaster muscle, they form an elevated vascular band, which stops the hand of the operator when in the act of opening the sac of the hernia. Le Dran (*n*) wrote, that in operating on a large scrotal hernia, he met with the spermatic cord situated on the anterior‡ surface of the hernial sac, which circumstance gave rise to various conjectures, none of which were satisfactory to those who only knew that the protrusion of the viscera through

(*m*) Camper, Loc. Cit.

* Dorsad of. † Sternal aspect.

(*n*) Operations de Chirurg. pag. 127.

‡ Sternal aspect.

the inguinal ring always takes place before* the spermatic cord (*o*), such being the position in the abdomen of the great sac of the peritoneum, with regard to the spermatic cord; and they were entirely ignorant of the changes to which the cord is subjected, in consequence of the increase of the scrotal hernia. The observation of Le Dran is not however the less true and accurate, and the explanation of this very important fact is clear and evident, from the anatomico-pathological inspection of the spermatic cord in inguinal hernia of moderate size, compared with the position of the same cord in large and old scortal hernia. For in the former, the spermatic vessels are kept united into one bundle behind† the hernia, and in large scrotal hernia these vessels are not only separated, but the separation of them is sometimes carried so far, that they are found removed from behind‡ the hernia to its sides, and even to the anterior§ surface of the hernial sac, especially in the vicinity of its lower part. The analogy between large scrotal hernia and hydrocele of the vaginal coat

* On the Sternal aspect of.

(*o*) Lassus, Med. operat. T. 1. pag. 152. Ledran dit avoir vu, une fois, le cordon spermatique situé sur la portion antérieure du sac herniaire. Je n'ai jamais vu ce cas, et je n'en conçois pas meme la possiblité. Le cordon spermatique est toujours derrière, ou un peu à coté du sac herniaire.

† On the dorsal aspect of the hernia. ‡ The dorsal aspect of.

§ Sternal aspect.

of the testicle, induced me to suspect, that the same phenomenon with regard to the decomposition of the spermatic cord might likewise occur in that disease. The dissection of dead bodies has proved that I was correct in my conjecture; as in all large hydroceles of the vaginal coat, I have found the spermatic vessels separated and transposed, so that the artery, with the vas deferens, occupied one side of the watery tumor, and the veins the other side, and sometimes both of these vessels, in the manner of a band, passed, on both of the sides, or even upon the anterior* surface of the vaginal coat at its lower part.

Having demonstrated, that, in scrotal hernia of long standing and of a large size, the spermatic cord, in consequence of the constant pressure exercised on it by the hernial tumor, is at last separated in such a manner, that the artery and vas deferens are found on the one side, the veins on the other side removed from the posterior † to the lateral part of the hernia, and even to the anterior ‡ surface of the hernial sac, I conjectured that the same separation and change of position of the vessels of the cord ought to take place also in cases of inveterate and large hydrocele of the vaginal coat of the testicle, which coat supplies the place of the hernial sac in *congenital* scrotal hernia, in

* Sternal aspect. † Dorsal. ‡ Sternal.

which disease it is an undoubted fact, that the separation and transposition of the vessels of the spermatic cord occur in the same manner as in *common* scrotal hernia. This pathological truth I have in fact repeatedly met with in the dead body of those who have been affected with a large hydrocele for a long time. I have not added any remarks with regard to the danger of wounding the spermatic vessels in a case of operating on an old and large hydrocele by puncture or incision, as I have done in detail in speaking of the precautions which it is proper to take in making the incision into the sac of an old and large scrotal hernia, MEMOIR II. § 2. because the circumstances with regard to the transposition of the spermatic vessels being the same in both cases, the same precepts would be understood as applicable to both diseases, and because, although the puncture of a hydrocele has been very frequently followed by copious effusion of arterial blood into the vaginal coat, no well established fact was, to the best of my knowledge, referable to the injury of the spermatic artery. The following well authenticated case (*p*) of this accident, will serve to prove my assumption, and to fix particularly the attention of young surgeons on this subject.

(*p*) Communicated to me, by letter, by M. Gasparoli, chief surgeon of Pallanza, 10th April, 1810.

On the 3d February, Angelo Maria Rossi, of the district of Cavandone, applied to me to be punctured for a double hydrocele which he had had for five years. I placed the patient in the proper posture, and having laid hold of the scrotum from below, I compressed the fluid, without being able to feel the testicle at its attachment to the vaginal coat. I took the trocar, *and introduced it a little obliquely at the lower part, to give a greater declivity to the water. On withdrawing the* trocar, *blood immediately issued, mixed with an almost gelatinous fluid, and I was repeatedly obliged to clear the canula, as several fibres resembling melted down cellular substance collected in it, and prevented the passage of the water, blood always continuing to be discharged mixed with the fluid. Having emptied the tumor as much as possible, I withdrew the canula, not considering the discharge of blood of any importance, supposing that I had wounded some small cutaneous vessel in making the puncture. I applied some lint with a suspensory bandage, and the patient departed to return home. After having proceeded a quarter of an hour on his journey, he observed, that the tumor began again to swell, and he felt, as he expresed it, like the beating of his heart in it. Having returned back, he again came to me, and on examining the tumor, I found it much enlarged, and blood oozed out by the aperture formed by the canula, with which the whole dressings were soaked. I laid hold of the integuments round the opening with two fingers, and*

I kept them compressed for some time, to endeavour to stop the blood, always supposing it to be some vessel of the scrotum which had been wounded. But the tumor continued to increase, and a pulsation was felt in it. I then resolved to open the tumor, to see in what manner the hemorrhage could be stopped. With a bistoury I began the incision from the opening made by the canula upwards towards the ring. The moment the incision was made, a great quantity of blood gushed out, which I knew to be arterial, and I saw that it flowed* per saltum *from the upper† part near to the ring. I extended the incision to the ring, and instantly a large arterial vessel presented itself to me, which poured out blood copiously; and having laid hold of it with the tenaculum, I tied it; after which the hemorrhage stopped, except the blood discharged from the incision. As I did not know how this accident had happened, I laid the testicle completely bare, to ascertain if it were possible that the spermatic artery had been wounded by the* trocar; *which in fact I found to be the case; the testicle only remaining attached by a small thread, which did not pulsate when taken between the fingers; and I farther discovered that the cord was divided into two parts from the ring downwards‡, without its usual sheath. Considering therefore that the testicle could not have lived without the nourishment of the blood, the spermatic artery being completely divided, I removed it. I applied the necessary dressings, and*

* Atlantad. † Atlantal. ‡ Sacrad.

the cure going on regularly, the patient soon recovered, having still the other hydrocele, which I will never venture to puncture, in order to avoid the accident which happened in the former.

According to the accurate knowledge which we now possess on this point of pathology, we may avoid a similar misfortune, if, in puncturing a large and old hydrocele, as in opening the sac of an old and large scrotal hernia, the instrument be introduced exactly in a line, running longitudinally through the middle of the tumor, and plunged in at a distance from its bottom, so that the puncture is a little lower * than the middle of the tumor. Because experience shows, that for evacuating completely the water contained in the vaginal coat, it is never necessary to puncture the hydrocele very near to its lower † part, and that the corrugation of the scrotum, along with gentle pressure, are sufficient for discharging all the fluid from the puncture made about the middle of the tumor.

§ 25. The change of position to which the epigastric artery is subject, in the greater number of cases of inguinal hernia, is not less remarkable than that which has been just explained. This artery, which runs about ten lines distant from the external‡ side of the inguinal ring, changes so much its natural situation and direction, in per-

* More sacrad. † Sacral extremity. ‡ Lateral aspect.

sons affected with inguinal hernia, that it passes under and behind * the neck of the hernial sac (*q*), and is removed from the external to the internal side † of the inguinal ring. The reasons of this change, and the manner in which it takes place, may be deduced from what I have said above with regard to the commencement of inguinal hernia, and the intersection formed by the passage of the spermatic cord over ‡ the epigastric artery. The first appearance of inguinal hernia is observed where the spermatic cord passes under § the fleshy margin of the transverse muscle, which passage is situated a little farther backwards || towards the side, than that of the origin and course of the epigastric artery towards the rectus muscle of the abdomen. But as the hernial sac constantly follows the course of the spermatic cord on which it rests, and the cord passing through the canal between the aponeuroses of the abdominal muscles towards the inguinal ring, crosses (*r*) the epigastric artery, therefore of necessity the hernial sac also passes over ¶ the epigastric artery, before approaching to and passing out of the inguinal

* Dorsad of.

(*q*) Pl. II. 4. 5. 6. Pl. III. 4. 6. 8. Camper Icones Hern. Tab. x. P. H. Tab. xii. N.

† Lateral to the mesial aspect. ‡ Dermad of. § Sacrad of.

|| More dorsad and laterad, and yet more to the dermal aspect.

(*r*) Pl. X. 11. 12.

¶ Dermad of.

ring. In the mean time, the internal * aperture of the hernia enlarging, and the length of the inguinal canal becoming shorter by the approach of its internal † orifice to that of the ring, it happens, that on the appearance of the inguinal hernia in the groin, the epigastric artery is of necessity found situated ‡ behind the neck of the hernial sac, and pushed from the outer § to the inner ‖ side of the inguinal ring. Suppose a thread passing from the cavity of the abdomen, into the hernial sac, and including the whole inguinal canal, following the direction of the spermatic cord; if this thread is tied so that the internal ¶ orifice of the hernia, which is situated beyond ** the intersection of the spermatic and epigastric arteries, approaches to the pubes, and advances in a direction from the ring to the sacrum, the epigastric artery will be carried from the external †† to the internal ‡‡ side of the hernial sac; and this will occur the more readily in the formation of the hernia, the larger it becomes. Except in some rare cases, this transposition of the epigastric artery, may be considered as a constant occurrence in persons affected with inguinal hernia. And undoubtedly, in the great number of dead bodies of persons affected with hernia which I have examined, I have only met with a very few

* Atlantal. † Atlantal. ‡ Dorsad of. § Lateral.
‖ Mesial. ¶ Atlantal. ** Laterad of. †† Lateral.
‡‡ Mesial.

in which the epigastric artery remained in its place, or on the outer * side of the neck of the hernial sac and of the inguinal ring (*s*). In these subjects, on investigating the cause which had given rise to this exception, I found in all of them the muscular and aponeurotic parietes of the abdomen, from the iliac region to the pubes, much weaker and more flaccid than what is usual in hernial patients; further, I observed that the viscera had passed through the aponeuroses of the transverse and *internal* oblique muscles, not in the vicinity of the ilium, as usually happens, but a little before these aponeuroses were inserted into the pubes, occasioning an unusual curvature of the superior † pillar of the inguinal ring (*t*), disproportioned to the small size of the hernia. In the same manner, the neck of the hernial sac did not advance, as it usually does, in an oblique line descending from the side to the pubes, but opened for itself an almost direct passage from the sacrum to the inguinal ring, in the direction of the small axis of the pelvis. In a word, in the subjects of which we are speaking, the peritoneum had not begun to form the depression of the hernial sac under the fleshy margin of the transverse muscle,

* Lateral aspect.

(*s*) Pl. I. 5. 6. 7.

† Atlantal.

(*t*) Pl. i. b. b. k. k.

where the spermatic cord passes out from the muscular parietes of the abdomen, but through the two aponeuroses of the transverse and internal oblique muscles, in the vicinity of the pubes on the inner side * of the principal origin of the cremaster muscle, which is as much as to say, on the inner side † of the place where the spermatic cord crosses over ‡ the epigastric artery. On which account, the hernial sac, resting upon the spermatic cord, on the inner § side of this intersection, had, together with the cord, found a nearer exit through the inguinal ring, without removing the epigastric artery from its natural situation and direction.

This species of hernia is, properly speaking, a combination of *ventral* and *inguinal:* it approaches to the former, as the hernial sac passes through the aponeuroses of the transverse and internal oblique muscles opposite to the inguinal ring; and it resembles the common inguinal hernia, in passing in the same manner through the inguinal ring, along with the spermatic cord.

§ 26. This unusual species of hernia occurs when the abdominal viscera find a greater facility in passing into the groin, through the inferior || fossa of the peritoneum (*u*), separated from the

* Mesial aspect. † Mesiad of. ‡ Sternad of.

§ Mesial. || Sacral.

(*u*) § 9.

superior * by the interposition of the division formed by the umbilical ligament, together with the fold of peritoneum which ascends at the side of the urinary bladder. This unusual species of inguinal hernia has been observed also by Hesselbach (*v*), and this author has even thought it of advantage to practitioners, to distinguish inguinal hernia into *external* and *internal* †; that is, into that which has its beginning in the superior ‡ fossa of the peritoneum towards the side, and beyond § the intersection formed by the passage of the spermatic cord over ‖ the epigastric artery, and into that which, deriving its origin from the inferior ¶ fossa of the peritoneum, protrudes in the groin opposite to the inguinal ring, and consequently on the inner ** side of the intersection of the spermatic cord and epigastric artery. This distinction, correct in point of fact, would be of great advantage in the practice of the operation of incarcerated inguinal hernia, if the distinctive characters pointed out by the above mentioned writer, were equally evident in large as in small herniæ of this species. For, *internal* †† inguinal hernia of small bulk has a peculiar roundness, and forms around the inguinal ring a much

* Atlantal.

(*v*) Anatomisch. chirurg. Abhandlung über den Ursprung der Leistenbrüche.

† Lateral and mesial. ‡ Atlantal. § Laterad of.
‖ Sternad of. ¶ Sacral. ** Mesial. †† Mesial.

greater swelling, than that which *external* * inguinal hernia presents, of a similar size; *internal* † inguinal hernia does not form any tumor of a cylindrical shape in the bend of the groin towards the ilium; on being returned, the *internal* ‡ hernia does not give any sound or gurgling; the spermatic cord and the testicle in *internal* § inguinal hernia, are placed on the external ‖ side of the hernial sac nearest to the ilium. Undoubtedly, when of equal bulk, the roundness of the tumor and the elevation of the superior ¶ pillar of the ring, in ** *internal* (*w*) inguinal hernia, are greater than that of the *external* ††, and it is very true, that in the *internal* ‡‡, there is wanting that cylindrical swelling along the bend of the groin, corresponding to the canal by which the spermatic cord descends between the aponeuroses of the abdominal muscles. But both these marks cease to be characteristic, when *external* §§ inguinal hernia has become very large, as the ring, much dilated, then communicates almost directly with the cavity of the abdomen; and on this account, in most cases, there is none of the gurgling, which the viscera produce on being returned. And with regard to the position of the spermatic cord,

* Lateral. † Mesial. ‡ Mesial. § Mesial.

‖ Lateral aspect. ¶ Atlantal. ** Mesial.

(*w*) Pl. I. b. b. k. k.

†† Lateral. ‡‡ Mesial. §§ Lateral.

and of the testicle, relative to the hernial sac, there is no doubt that, in *internal* * inguinal hernia of small size, the spermatic cord is found on the side of the tumor contiguous † to the ilium (*x*), contrary to what is observed in *external* ‡ inguinal hernia of equal bulk; but as soon as the *external* § has become very large, the separation which takes place in the spermatic vessels, and the removal of these towards the sides of the tumor, render this mark fallacious. Nevertheless, in a case of small inguinal hernia, an attentive surgeon has sufficient marks to determine, not only to which of the two species it belongs, but also what is the position of the epigastric artery in relation to the neck of the hernial sac and to the inguinal ring.

§ 27. What has been hitherto said with regard to the origin and increase of *common* inguinal hernia, is for the most part applicable to the doctrine of *congenital* inguinal hernia, if we except, that in *common* hernia, the hernial sac is formed by the morbid protrusion of the peritoneum, while in *congenital*, it is formed by the natural elongation of the peritoneum constituting the vaginal coat of the testicle. The distinction into *external* ‖ and *internal* ¶ inguinal hernia, is not

* Mesial. † That points laterad.

(*x*) Pl. I. l. l.

‡ Lateral. § Lateral. ‖ Lateral. ¶ Mesial.

applicable in the *congenital*, because the *external** only can in that case be formed; as the neck of the vaginal coat invariably corresponds to that point of the abdomen, where the spermatic cord passes out from the muscular parietes of the abdomen, under the fleshy margin of the transverse muscle. The vaginal coat situated above the cord, in the same manner as the hernial sac in *common external*† hernia, follows the natural course of the spermatic cord; therefore, it passes between the separation of the inferior ‡ fleshy fibres of the *internal* oblique, and the principal fleshy origin of the cremaster muscle (*y*). The vaginal coat on passing out of the ring, united to the spermatic cord in the same manner as the hernial sac in *common* inguinal hernia, is included in the muscular and aponeurotic sheath of the cremaster, which surrounds and accompanies it to the bottom of the

* Lateral. † Lateral. ‡ Sacral.

(*y*) Wrisberg. *Sylog. comment. anat.* pag. 23. In cadavere pueri annorum quatuor, aperto, sectione transversali infra umbilicum, abdomine, ut ea lineæ albæ pars, quæ ab umbilico ad pubem descendit illæsa maneret, peritonæum caute ab ambitu anteriore musculorum abdominalium inferioris partis solvi et removi ad vescicam urinariam usque. Evidentissime jam peritonæi infra marginem transversalis musculi in tunicam vaginalem progressum immediatum notavi. Obliquum minorem autem revera perforavit in utroque latere, ut teneri adeo fibrarum muscularum fasciculi cremasterem formantes ultra $\frac{2}{3}$ tunicam vaginalem amplecterentur. Hoc modo formatus peritonæi processus, per annulum obliqui majoris abdomen egrediebatur.

scrotum. And since the neck and orifice of the vaginal coat, on the side next the cavity of the abdomen, in the same manner as the depression formed by the peritoneum in *common external** hernia, is situated higher up † towards the side, than the place where the spermatic cord crosses over ‡ the epigastric artery, so the vaginal coat containing the protruded viscera, following constantly the course of the spermatic cord, passes over § and intersects this artery, and causes it, in *congenital* inguinal hernia also, to be pushed from the external || to the internal ¶ side of the inguinal ring. Notwithstanding, so great a similarity of the parts constituting *external* ** inguinal and *congenital* hernia, there are some differences between these two diseases, which deserve to be particularly recorded. In the first place, in *common* hernia, when it approaches the bottom of the scrotum, the hernial sac stops where the cellular substance terminates, which unites into one body the hernial sac with the spermatic cord, or where the spermatic vessels are inserted into the testicle behind †† the vaginal coat, and opposite to the epididimis. In *congenital* hernia, on the contrary, the viscera descend farther into the scrotum than in *common* hernia, and are in contact with the testicle, and are found still lower ‡‡ even than the testicle,

* Lateral. † More atlantad. ‡ Sternad of. § Sternad of.
|| Lateral. ¶ Mesial. ** Lateral.
†† Peripherad and dorsad of. ‡‡ More sacrad.

which in large herniæ of this species is forced to yield its place, and to remove backwards, and more upwards* than the bottom of the hernia. In the second place, in *congenital* hernia, the descent of the viscera, from the groin to the bottom of the scrotum, is in general very rapid, and (I would say as it were) instantaneous, while on the contrary, in *common* inguinal hernia, the descent of the viscera from the ring into the scrotum takes place gradually and rather slowly; because the hernial sac can only descend, in so far as it is permitted to do so by the elongation of the layers of the cellular substance, which unites the hernial sac to the lumbar region, and to the spermatic cord; whereas, in *congenital* hernia, the passage for the descent of the viscera, from the ring into the scrotum, is already open and prepared, to use the expression, by the previous formation of the vaginal coat, and the descent of the testicle. On which account, experienced practitioners, and diligent observers, justly consider as a characteristic mark of *congenital* scrotal hernia, the facility and quickness with which the protruded viscera have descended from the ring to the bottom of the scrotum.

§ 28. A farther analytical examination of *congenital* hernia, compared with *common* hernia, pre-

* More dorsad and atlantad.

sents the following peculiarities. There is the same arrangement of parts in both cases, with respect to the passage of the vaginal coat under * the fleshy margin of the transverse muscle, and between the inferior † fleshy fibres of the *internal* oblique, as well as in what regards the sheath of the cremaster and the cellular substance interposed between this sheath and the vaginal coat. The density of the latter does not exceed that of the peritoneum in its natural state, and even, according to the opinion of Bell (*y*) and Meckel (*z*), is less than that which the hernial sac presents in common hernia. The cellular substance interposed between the sheath of the cremaster and vaginal coat, is not so pliable and soft as in common hernia in similar circumstances, as to the bulk and duration of the disease, on which account the separation of the sheath of the cremaster from the hernial sac formed by the vaginal coat, is not equally easy in *congenital* as in *common* hernia. In *congenital* hernia, on opening the whole length of the sheath of the cremaster, there is no furrow or division at the bottom of the hernial sac, such as is found in *common* hernia between the hernial sac and the vaginal

* Sacrad of. † Sacral.

(*y*) A System of Surgery, vol. I. p. 355.

(*z*) Tractatus *de Morb. Hern. Congenito* Zimmermanni, pag. 28. Saccus ipse herniosus, separata nunc scroti cute, ab omento impulso, duplo major, *tenue peritoneum erat*, pellucidum, per quod omentum undique transparebat.

coat of the testicle, as both the protruded viscera and the testicle are contained within the same sac. It is impossible to turn the bottom of the hernial sac upwards * in *congenital* hernia, as may be done in *common* hernia, leaving the spermatic vessels with the testicle in their situation; for it is not possible in *congenital* hernia to raise and invert the bottom of the vaginal coat forming the hernial sac, without raising at the same time and turning upwards † the testicle and the spermatic vessels which are inserted into it. Upon which point, I cannot mention but with horror the injury which, from a want of this knowledge, was practised on the celebrated physician Zimmermann (*a*), from the false persuasion under which the surgeon laboured, of being able to raise up the bottom of the vaginal coat without removing the spermatic vessels from their situation, and to tie it at its neck, in order to prevent the return of the hernia, according to an erroneous and already antiquated opinion.

§ 29. Petit (*b*) was of opinion, that inguinal hernia sometimes passes out, not properly speaking through the ring, but opens itself a passage through the texture of the aponeurosis of the *external* oblique, sometimes on the one, sometimes on the other side of the ring. He mentioned that-

* Atlantad and sternad. † Atlantad and sternad.

(*a*) Meckel Loc. Cit. pag. 29.

(*b*) Œuvres Posthum. T. ii. pag. 316.

he had observed twice this species of inguinal hernia, about the size of an olive, accompanied by the most severe and dangerous symptoms. Another example of this kind has been related by Jouille (*c*). However, none of these three observations have been proved by the anatomico-pathological examination, the only means of establishing with certainty the identity or truth of these and other similar facts. Nevertheless, some writers of surgery do not hesitate to ascribe the origin and formation of double inguinal hernia on the same side, to this combination of circumstances. With regard to which, although I do not pretend to deny the possibility of the viscera, in some very rare cases, abandoning the guide of the spermatic cord, and forming a passage through the fibres of the aponeurosis of the *external* oblique, in the vicinity of the margin of the inguinal ring, since I observe a similar separation occur in the *linea alba*, in the vicinity of the umbilical aperture, and in the aponeuroses of the *internal* oblique and transverse muscles opposite to the inguinal ring, yet, I affirm, that this is certainly not the usual manner in which double inguinal hernia of the same side is formed. For, in opposition to the three cases just quoted, appear a very considerable number, which evidently prove, that *double* inguinal hernia on the same side, is a combination of

(*c*) Traité des Hernies, p. 98.

common inguinal and of *congenital* hernia, both protruding through the inguinal ring on the same side. Arnaud (*d*) gives several examples of it, others are mentioned by Sandifort (*e*), and a similar case is related by Brugnone (*f*), Masselin (*g*), and Wilmer (*h*); the observation of the latter deserves to be related here in detail, for the convenience and advantage of young students. "I was called," said he, "to visit a middle aged man with an "incarcerated hernia, to replace which all the "ordinary means of art had been employed in "vain. The patient recollected that he had been "cured of a hernia in his infancy, and that it was "only about six or seven years since a fulness had "reappeared in the same place, which had only "incommoded him a few days before the incar-"ceration, brought on in consequence of an "exertion. We agreed upon an operation, which

(*d*) Memoires de Chirurg. T. ii. p. 603—607.

(*e*) Natuur-en Geneesk. Bibliot. V. D. pag. 354.

(*f*) Dissert. de Test. in fœtu posit. § 44. Raro quidem, quandoque tamen evenire, ut idem homo ab eodem latere duplici hernia laboret; altera *vulgari, congenita* altera, cujus casus, superiore anno, in hominis quinquagenarii cadavere sese mihi obtulit. Fieri quoque posse, ut in eodem homine hernia *vulgaris et hydrocele congenita* insit, qualem morbum curavit celeber noster Penchienati.

(*g*) See Richter Chirurg. Bibliot. T. vii. p. 591.

(*h*) Practical Observations on hernia, p. 104.

" was performed by Mr. Jervis. The swelling " occupied the whole scrotum; the testis on that " side was not perceptible. Upon dividing the " hernial sac, a considerable quantity of water " issued out, and a large fold of intestine, very " dark coloured, was found in contact with the " testis. The tendinous opening of the muscles " was dilated, and the intestine was returned " fairly into the belly. There was still a very con- " siderable thickness and tumor of the spermatic " cord, and whilst we were examining it, through " an opening so small as not to admit the obtuse " end of the probe, a jet of a thin, brown fluid, of " an offensive smell, broke out, and continued " many minutes. We formed various conjectures, " none of which were very satisfactory, of the cause " of this phenomenon. The wound was treated in " the usual way, and the man ordered to bed; but " the discharge of the fluid I have described, made " its way through the dressings and bandages. The " symptoms of strangulation still continued, and " the patient died in about thirty hours after the " operation. Upon dissection, Mr. Jervis found " the portion of the ileum which he had returned " much recovered in its complexion: tracing the " intestine forward, he was surprised to perceive " another portion of the same intestine included " in a proper and distinct hernial sac, and this " second portion of intestine was found stangulat- " ed in the groin of the same side, and gangren-

" ous. In a word, in this case there had been two " herniæ, distinct from each other, in the same " groin, and protruding by the same ring, the one, " viz. with its proper sac formed by the perito- " neum, the other formed by the descent of the " viscera into the vaginal coat of the testicle."

§ 30. With regard to the descent of the small intestinal canal into the scrotum, and the changes of position which some of the viscera contained in the abdomen undergo, in consequence of intestinal or omental inguinal hernia, I have repeatedly had occasion to observe, that of the portion of small intestine constituting the fold, which has descended into the scrotum, one part very often passes over another in the form of the figure 8, so that frequently on opening the tumor, it is impossible to determine accurately what part of the fold corresponds to the superior portion, and what to the inferior part of the intestinal tube. I cannot however say, whether this twisting takes place in the act of the intestine descending through the inguinal ring, or after the hernia has enlarged very much, and the ring become more dilated than usual. And with regard to the changes of position of the viscera contained in the abdomen occasioned by this disease, in those cases in which the inguinal hernia is only formed by a minute portion of small intestine, the derangement of the viscera in the cavity of the abdomen is only evident in that small portion of

mesentery corresponding with the protruded fold of intestine, which fold of mesentery is constantly more elongated than natural, and likewise thicker and more loaded with fat than usual, and interspersed with dilated and varicose blood vessels. This fatty thickening of the mesentery, is always observed even in the most emaciated subjects, in which it seems as if the little fat which is found in the mesentery, descends and accumulates in that portion of this membrane, supporting the fold of intestine forming the hernia, and this, it appears to me, ought to have some share among the causes that produce strangulation. If the scrotal hernia is formed by the extremity of the ileum, contiguous to its insertion into the colon, besides the descent of this intestine, an inconvenience worse than that just mentioned is the consequence, viz. that of drawing gradually along with it the cæcum, with its appendix *vermiformis*, into the scrotum, which cannot fail to induce a remarkable change of position also in the rest of the large intestines situated in the abdomen, and consequently in the viscera, which are in close connection with the colon. In fact, in the dead bodies of persons affected with large scrotal hernia, produced by the descent of the *cæcum*, an evident depression is observed in the right side; the right and transverse colon are found displaced and drawn unusually downwards, towards the umbilicus, and along with them the fundus of the stomach and omentum.

The displacement of the above mentioned viscera, is not equally considerable when the hernia is formed by the colon of the left side, as in this case more of that portion of the left colon, which formed the *sigmoid* flexure, descends into the scrotum, than of that which occupies the left epicolic region.

With regard to the omentum, the descent of this viscus takes place more frequently in the left groin than in the right. This circumstance was remarked by Vesalius (*i*) and by Riolanus (*k*), and has been confirmed by many other surgeons very well skilled in the treatment of these diseases, especially Arnaud (*l*), who did not hesitate to assert, that of twenty omental inguinal herniæ, nineteen are on the left side. The omentum in the abdomen of hernial patients assumes the form of a triangle, the apex of which is in the scrotum, and the base attached to the fundus of the stomach and to the transverse colon. The omentum, descending into the groin, contracts upon itself in the manner of a cord, the folds and convolutions of which are more straightened and more approximated to each other the nearer they approach to the inguinal ring, where sometimes

(*i*) De H. C. Fab. Lib. v. Cap. iv. xix.

(*k*) Anthropograph. Lib. LXXI. cap. xi.

(*l*) Memoires de Chirurgie.

the whole mass of omentum is only a few lines in diameter, while the rest of it in the abdomen spreads out in the form of a fan. The protruded portion of omentum becomes hard, very dense and compact, and not unfrequently resembles a fibrous substance covered by a fine smooth membrane. Sometimes, as it passes out of the ring it forms a pedicle, and then spreads out and enlarges in the scrotum like a fungus. The larger portion of the omentum also, which is in the abdomen, has in general a greater thickness and hardness than in the sound state, which probably depends upon the irritation produced by the continual stretching, by the varicose state of the venous vessels, and by their regular accumulation of fat. Great protrusions of omentum, as has been mentioned, necessarily displace the transverse colon and the stomach; the latter, however, according to my observations, is less removed from its situation than the colon; and the former is never drawn down equally at every part, but more at its middle than at its sides.

§ 31. Omental hernia of small size, has so great a resemblance to diffused hydrocele of the spermatic cord, while this disease is situated so high* up as to occupy and dilate the inguinal ring, that the most experienced surgeon finds great

* Far atlantad.

difficulty in distinguishing the one of these diseases from the other. The cylindrical form of both these tumors, the unnatural dilatation which both of them produce in the inguinal ring, the consistence, the sensibility nearly equal in both, the similar difficulty which the surgeon experiences in their replacement, are all circumstances which render the diagnosis obscure. Pott pretended that he had found a proper and distinctive character of diffused hydrocele of the spermatic cord, viz. that the omentum returned into the abdomen, remains there as long as the patient keeps in the recumbent posture, and does not make any exertion; while, on the contrary, diffused hydrocele of the cord pushed beyond* the inguinal ring, re-appears when the replacement is scarcely effected, although the patient remains recumbent without coughing, or making any effort to rise. If this occurs in some cases, it certainly does not prove true in all. I can assert, that I have repeatedly observed omental inguinal hernia of a cylindrical form, which when scarcely returned re-appeared as before, without the patient having changed his posture, or made the slightest exertion; and in like manner, I have seen *diffused* hydroceles of the spermatic cord, which when pushed beyond† the ring, remained there as long as the patient kept himself in the

* Atlantad of.

† Atlantad of.

supine posture, without making exertion. In the dead body, I have been several times misled, conceiving that I had under my fingers a small omental hernia, because the tumor had an elongated form, and was soft, and on being pushed up, was entirely, or in a great measure, concealed behind* the inguinal ring; however, on dissecting the parts, I found, not without surprise, that the tumor was formed by a gelatinous fluid effused into the cellular substance surrounding the spermatic cord, which watery effusion extended a little above† the ring. But, with regard to this point, what has appeared to me to be the least uncertain is, that the consistence and irregularity of the surface of the tumor are somewhat greater, to the touch, in small omental hernia, than in diffused hydrocele of the cord, and that the latter is always broader at the lower‡ part than towards the ring, contrary to what is the case in small omental hernia. At any rate, we must confess the imperfection of the art with respect to this point of diagnosis, and instead of passing it over in silence, it is proper to mention it openly, in order that beginners in the practice of surgery may be upon their guard before deciding definitively on this point. Further, no learned and experienced surgeon will ever meet with any remarkable difficulty in distinguishing true hernia

* Centrad of. † Atlantad of. ‡ Sacral.

from incysted hydrocele of the cord situated below * the inguinal ring, from that of the vaginal coat, from the varicose state of the spermatic vessels, and other similar affections, known by the name of *false* hernia, the characteristic symptoms of each of these diseases being numerous and evident.

§ 32. In reflecting upon the very great difference in the treatment of hernia by the antient surgeons, and that which is practised by the moderns, viz. that the antients operated on hernia not strangulated, removing the testicle at the same time, without the security of thereby preventing the return of the disease, and always with danger to the life of the patients; while modern surgeons only operate on strangulated hernia, and cure or render the not strangulated harmless and supportable, by means of mild mechanical methods, we must allow, that of all the benefits which modern surgery has conferred upon the human race, that of the invention and perfection of the truss is one of the most conspicuous. Fabricius ab Aquapendente (*m*) wrote on this subject: *The operation for hernia is so dreadful and dangerous, that although many escape, many nevertheless die under it, or soon after; whence it happens, that surgeons undertake to cure these patients as des-*

* Peripherad of.

(*m*) Operat. Chirurg. Cap. LXXV.

perate cases. On which account, I have always been of opinion, that patients ought on no account to expose themselves to this danger, especially being able to wear the truss during the whole of their life, without the risk of shortening it a single day; which advice I give the more willingly, as conversing lately with Horatio Norsia, an operator very skilful in this matter, he told me, that formerly he had every year operated on more than 200 patients, and that at present he scarcely operated on 20; and he replied to me, on asking him the reason, because many cured themselves by wearing the truss, and applying astringent applications.

There is no surgeon who is not firmly persuaded of this truth; yet, from one of the many contradictions in human life, the art of constructing and applying the truss is nevertheless in the hands of illiterate men, entirely ignorant of the nature and varieties of the disease which they wish to cure; and no one, at least in Italy, of the most experienced practitioners, occupies himself, I do not say in forming with his own hands, but in directing the construction and application of these bandages, so that I would even venture to say, that their knowledge of this subject is very limited and imperfect, and the greater number of them shew, that they have not paid all the attention requisite to this important article of surgery. For although surgeons generally agree among themselves, with regard to the preference to be

given to the elastic over the inelastic bandages, yet with respect to the elastic, they differ about the length of the spring, and form of the pad. Some think that the semicircular spring is sufficient for the purpose, others contend that the spring ought to be extended from one side to the origin of the fascia lata of the opposite side, so that of twelve parts of the whole circumference of the pelvis, the spring should surround ten. These two opinions, however, as far as appears to me, are, if not entirely, at least in a great measure reconcileable to each other, if we would attentively consider the fundamental principles of the mechanism of elastic bandages, and if we would appreciate impartially the results of the observations and of the experiments, which have been made in employing the one or other species of elastic bandage, in analogous or dissimilar circumstances.

In general, whatever be the length given to the spring, when applied around the pelvis, it represents a lever of the third species, the power of which is at the middle of the convexity of the spring, the resistance in its extremity which rests upon the inguinal ring, and the fulcrum in the opposite extremity of the spring, situated upon the lowest lumbar vertebræ, and on the upper* part of the sacrum. And as the action of the spring

* Atlantal.

may be compared to that of a pair of forceps opened very wide, which from the smallest movement of the part which it grasps, has a great tendency to abandon its hold and separate; so on the other hand, if the fulcrum or posterior* extremity of the spring be kept steadily in its place, the force of the pressure will be equally constant and equable, which the resistance or the anterior† extremity of the spring will exercise upon the inguinal ring. The difficulty, therefore, of obtaining a good elastic bandage, consists in finding the manner of giving the greatest possible steadiness to the fulcrum of the arm of the lever, which we wish to make to act on the inguinal ring. Hitherto, this has been effected by a strap, added to the posterior‡ extremity of the spring, which completes the circle of the pelvis, and is united anteriorly§ to the pad or compressor. Roussile-Chamseru (*n*), has proposed to enlarge and thicken the posterior‖ extremity of the spring, in order to render it inflexible, and to make it to rest upon a greater surface than usual, from the loins to the sacrum. I have executed this proposal, by giving as great a breadth to the posterior¶ extremity of the spring as to the anterior** in the situation of the compressor, and I have inclin-

* Dorsal. † Sternal. ‡ Dorsal. § Sternad.

(*n*) Mém. de la Soc. Méd. d'Emulation, T. iv.

‖ Dorsal. ¶ Dorsal. ** Sternal.

ed it, so that it rested exactly upon the last lumbar vertebræ, and on the beginning of the sacrum. This modification, along with some cautions which shall afterwards explain, corresponded completely to the intention, as long as the patient remained erect and immoveable; but as soon as he began to bend the thigh of the affected side, and to walk, the semicircular spring quitted the fulcrum, and at the same time the pressure ceased, which it exercised upon the inguinal ring. It was necessary to tighten the strap, and then the machine retained the hernia sufficiently well.

If the hernia is intestinal only, and of a small size, so that a moderate pressure upon the ring is sufficient to retain it, this form and dimension of the bandage undoubtedly answer the intention perfectly well, without there being occasion to tighten the strap so as to incommode the patient. But if the hernia is omental, or composed of intestine and omentum, and at the same time very large, the semicircular truss, in spite of the modification above pointed out, does not succeed in practice equally well as the elastic truss constructed upon Camper's principles (*o*), the spring of which surrounds the pelvis from the one side, and rests on the origin of the muscle of the fascia lata of the side opposite to the hernia, or includes $\frac{10}{12}$ of the whole circumference of the pelvis. I do

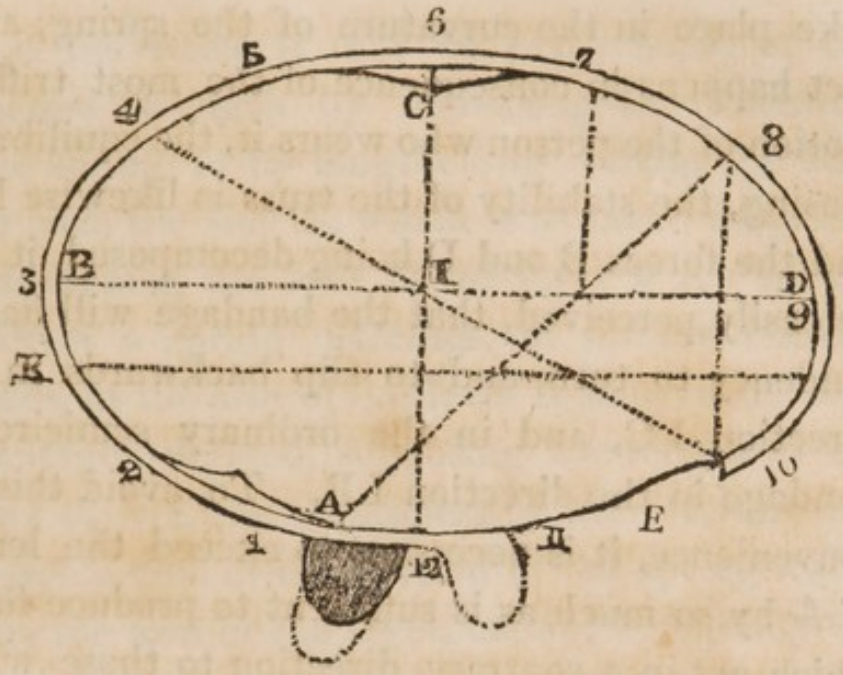
(*o*) Mém. de l'Acad. R. de Chirurg. T. xv.

not hesitate to assert, that of two springs of equal strength and elasticity, the one semicircular, the other lengthened out according to Camper's directions, the latter will retain the scrotal hernia with more steadiness than the former, and with less inconvenience to the patient, and it would likewise produce the same effect, although Camper's spring be some degrees less strong and elastic than the semicircular, and without the necessity of the strap being tightened with as much force as is requisite for fixing the fulcrum of the semicircular truss. In opposition to this practical fact, the arguments which have been adduced to the contrary by those who, prejudiced against Camper's directions, have never carefully and with impartiality made trial of the truss proposed by him, and have never attentively considered in what it agrees or disagrees with that of the semicircular spring, are of no importance, being all theoretical. Roussille-Chamseru (*p*) objects, *that Camper's spring is not a determined spring which re-acts at the two extremities of the lever, but that it is rather a power which is distributed weakly upon all the points of a circle, more flexible than elastic, which power is confounded and lost in the points of support and of compression, so that the whole machine is only a metallic cord, which has no other action upon the hernia than that which is communicated to it by*

(*p*) Loc. Cit. § xxiii.

the strap, which completes the circle of the pelvis. This author thought very unfavourably of Camper's truss, because, as it appears, he was not satisfied with the demonstration given by this celebrated surgeon, to prove, that the length of the spring of $\frac{10}{12}$ renders it more proper than the semicircular to retain the inguinal hernia. And I must admit that Camper's demonstration, although partly drawn from Bernoulli's theory of the elastic curve, is almost unintelligible, as it is not possible to apply these principles of mechanics exactly to the curvature of the spring for bandages. But if we give up the demonstration given by Camper, and combine the manner and direction in which the spring acts with the principle of the decomposition of the forces, it will be perceived that Camper's bandage, very far from proving an undetermined spring, and of no force, on the contrary, on account of its length, unites to stability of the point of support a greater force of elasticity than that of the semicircular spring, and as much as can be necessary for the purpose. It unites therefore two grounds which ought to determine the preference of one truss compared with another.

To demonstrate what I have stated, I shall take the same figure given by Camper reduced to the greatest simplicity of expression.



Let A, B, C, D, E, be the bandage of $\frac{12}{12}$, of which at present let us only consider the length B D equal to $\frac{6}{12}$, or to one half of the whole circumference of the pelvis. The elastic force, acting in the direction of the perpendicular to that point of the curve to which it refers, it follows that the forces D and B will be in equilibrium, being in direct opposition to each other, and the bandage will press equally, *cæteris paribus*, the points B and D, and therefore will remain fixed. And what I have said of the spring which surrounds the half of the pelvis from D to B, is applicable to the semicircular bandage which, surrounding the side, extends from A to C, which two points are in like manner in equilibrium with each other. On the smallest change which can

take place in the curvature of the spring, as in fact happens in consequence of the most triffling motion of the person who wears it, the equilibrium ceasing, the stability of the truss is likewise lost; and the forces B and D being decomposed, it will be easily perceived, that the bandage will have a tendency to turn, and to slip backwards in the direction I C, and in the ordinary semicircular bandage in the direction I B. To avoid this inconvenience, it is necessary to exceed the length of $\frac{6}{12}$ by so much as is sufficient to produce forces which act in a contrary direction to those which push the spring backwards, and which have energy sufficient to balance the action of the latter, without injuring, in other respects, the utility of the instrument. This is obtained by lengthening the spring from B to 2, and from D to E, or by giving it the length of $\frac{8}{12}$. By giving it such a length, the bandage will remain constantly steady, and therefore the point of support of the spring will be fixed. Now, if to the length E D B 2 be added the portion 2 A, bringing it thus to $\frac{10}{12}$, the point 2 being fixed, the spring 2 A will be free and well determined, and will constitute an arm of a lever, to which may be given that force which shall be judged necessary for the pressure we wish to apply upon the inguinal ring. And if the strength of the arm of the lever 2 A should prove too great, it may be weakened by making the spring thinner,

and if too weak, it may be easily made of the necessary strength by increasing the thickness of the spring, or by lengthening a little the bandage from the side E, which is as much as to say, by shortening the arm of the lever 2 A; for the power of a spring increases, in similar circumstances, as the arm of the lever is shortened. The advantages derived, supposing the length of the spring $\frac{10}{12}$, viz. the steadiness of the fulcrum and the free action of the portion of the spring which forms the arm of the lever, cannot be equally obtained from bandages of a less length than that above mentioned, and still less by those of a semicircle or of $\frac{6}{12}$ only, unless by tightening the strap and other similar agents, to retain the whole machine fixed. From which it follows, that although the semicircular bandage may, by tightening the strap, retain a small intestinal inguinal hernia sufficiently well, that with a spring of the length of $\frac{10}{12}$ can retain a small intestinal or omental hernia, and even a large hernia, by employing a spring less strong than that which is required for the semicircular bandage, or by tightening the strap much less than what is necessary to give a fixed point to the arm of the lever of the semicircular bandage.

Further, it is a thing worthy of observation, that whether we employ the semicircular spring,

or that of Camper, it is necessary to pay great attention to the following points. In the first place, the strength of the spring should be proportioned to the resistance which it is required to overcome: in the second place, the spring should be applied round the pelvis quite flat through its whole extent: in the third place, the pad or compressor should be adapted with regard to the size, and inclined with the greatest accuracy at the same angle which the inferior* margin of the abdomen makes with the os pubis, which is different in different persons; and farther, the point of compression, which it makes upon the inguinal ring, should be about two inches lower† in an adult, than the circular line which the spring describes on the loins and top of the sacrum. The compressor likewise, the smaller and more recent the inguinal hernia is, ought to press the more in the direction from the pubes to the side, as this is the course which the viscera take in their first descent from the abdomen to the inguinal ring. If the spring does not apply quite flat through its whole length, by the effort which the viscera constantly make to raise the base and apex of the compressor, the spring makes a rotatory motion, which facilitates the protrusion of the viscera; and if the compressor is not bent exactly at the angle which the inferior‡ margin of the abdomen makes

* Sacral. † More sacrad. ‡ Sacral.

with the os pubis, the compressor does not find a proper point of support upon the upper* part of this bone, and cannot compress all the points round the inguinal ring with equal force. And we never can expect a radical cure by means of a bandage in small and recent inguinal hernia, if we do not attend to compress with the ring, that portion of the neck of the hernial sac, which runs under† the aponeurosis of the *external* oblique, from the pubes towards the ilium. Further, the compressor ought to have a smooth surface, directed so that it intersects from above downwards‡ the oblique position of the inguinal fissure. There are particular circumstances, in which it is proper to give the preference to the *convex* compressor, and sometimes to the *conical.* These circumstances are, when the thickness of the integuments and of the fat of the groin opposite to the ring is such as to form a kind of funnel, on the bottom of which the fat compressor has no action. The same thing happens on account of the spermatic cord being much thickened in consequence of hydrocele of the cord, and of the vaginal coat of the testicle. I have met with some of these complications, in which the best elastic bandage with a flat compressor, was not sufficient to retain the

* Atlantal. † Centrad of.

‡ From the atlantal to the sacral aspect.

viscera, while on pressing my thumb deep so as to touch the ring, the viscera were retained in their position in spite of violent efforts which the patient made in coughing. In these cases, the application of Camper's truss with a conical pad succeeded perfectly well.

With regard to the spring, besides the due degree of temper and elasticity, which it is proper to give to this essential part of the instrument, proportioned to the size of the hernia, and to the difficulty of retaining it, it is of the greatest importance, that the workman who devotes himself to the formation of these instruments, give up the usual manner of taking the measure of the spring with an iron wire, or with tape or parchment, as the shape of the sides, every one knows, is not similar to that of the loins. He should rather employ a thin flexible plate of metal, about ten lines in breadth, which has on its anterior extremity the pad of the compressor, of a length and breadth proportioned to the dilatation of the inguinal ring, and to the direction of the neck of the hernial sac from the pubes to the ilium. This thin and flexible metallic plate, is to be carried by the workman from the inguinal ring round the pelvis, and fitted with accuracy to the shape of the parts upon which it ought to apply at with the strictest precision; he will then bend

* Sternal.

the plate of the compressor as much as is necessary, to form an angle perfectly similar to that which the inferior * margin of the abdomen makes with the os pubis. This thin metallic plate, being removed and placed in a convenient situation, that it may retain all the inflexions given to it, will serve as a model for the formation of the spring of the truss, which ought not to be tempered before it has been tried upon the hernial patient, to see if both it and the compressor apply exactly every where upon the groin, around the sides and on the loins. Lastly, the truss, the spring of which is $\frac{10}{11}$ in length, has no occasion for a *thigh* strap. Nevertheless, if for the greater steadiness of the machine, it shall be thought necessary in some cases to add it, as daily practice shews, that the inconvenience occasioned by this strap depends principally upon its stiffness, the uneasiness which it causes may be removed or diminished, by substituting, for the ordinary strap, that made in the form of the elastic braces, called by the French *bretelles*.

In the case of *external* † inguinal hernia of moderate size, which is the most frequent, where the neck of the sac retains the same direction as on the first appearance of the tumor in the groin, that is, from the ilium to the pubes, there can be no doubt, that the pad of the truss ought to be

* Sacral. † Lateral.

constructed and applied so as to press from the external * margin of the ring to the ilium, without at all injuring the spermatic cord, where it passes out of the ring. But in a case of *internal* † inguinal hernia, § 26, in which the descent of the viscera takes place in the direction from the sacrum to the pubes, the pad, compressing the hernia from the pubes towards the ilium, will act directly upon the spermatic cord at the part where it passes out of the ring, and therefore the patient will be unable to endure it. In a similar case, although rare, the difficulty may be overcome by making the lower edge of the pad of the shape of a swallow's tail, or rather of a horse shoe, in the excavation of which the spermatic cord will be contained, as it passes out ‡ of the inguinal ring.

* Lateral. † Mesial. ‡ Peripherad.

MEMOIR SECOND.

OF THE COMPLICATIONS OF INGUINAL AND SCROTAL HERNIA

§ 1. I do not intend to give, in this memoir, a regular minute detail of the operation for incarcerated inguinal and scrotal hernia,—that is found in every work on Surgery; but to fix the attention of young students upon some of the most important points of the operation, deduced from the pathological opinions of this disease, explained in the preceding memoir; and particularly to lay before young beginners in the art, the principal complications of hernia, illustrated by such observations and practical facts, as may serve for an example and guide to them in similar difficult circumstances.

§ 2. In treating of an incarcerated scrotal hernia of moderate size, it is of little importance if the incision of the integuments be made a little to

the one or other side of the longitudinal axis of the tumor; but in operating on an old and large scrotal hernia, it is a point of great consequence, that the incision of the integuments of the scrotum be made exactly in the middle of the whole length of the hernial tumor. For, as it is now a certain and demonstrated fact (*a*), that in old and large scrotal hernia, in consequence of the long and always increasing pressure exercised by the posterior * part of the hernial sac on the spermatic cord, the vessels composing it are separated, and at last displaced in such a manner, that they are no longer situated, as in the incipient stage, behind † the sac, but are forced upon its sides, and even to the anterior surface ‡ of the sac, especially in the vicinity of the lower § part; it follows, of course, that the incision of the integuments of the scrotum, which in the progress of the operation serves as a rule for the incision and aperture of the hernial sac, in deviating from the middle line, occasions the spermatic artery, alone or along with the vas deferens, to be included in the incision at the sides or at the bottom of the sac, which, every one perceives, must be a very great error, and therefore ought most carefully to be avoided. And for the same reason, I cannot commend the

(*a*) Memoir I. § 23. Pl. III.

* Dorsal. † Dorsad of. ‡ Sternal aspect.

§ Most dependent.

practice of those surgeons, who, in incarcerated and large scrotal hernia, after replacing the viscera, freely cut away the sides of the hernial sac through its whole length, as a superfluous part, and as preventing the quick cure of the wound of the scrotum. In doing this, which is neither necessary nor of any advantage, in my opinion, they expose the patient to the danger of severe hemorrhage, and to the loss of the testicle of that side. Many cases have in fact been recorded of severe hemorrhage occurring in the act of dividing the hernial sac, which accident has at all times been ascribed to an unusual morbid dilatation of the proper vessels of the hernial sac (*b*), surgeons not even suspecting, that the vessels which they had divided on the anterior surface* of the hernia, were those composing the spermatic cord. They might have avoided this accident, if they had made the incision of the hernia precisely at its longitudinal axis, or had not extended the section of the hernial sac too near to its bottom. A case of this kind, recently published (*c*), which it is proper to insert here, will greatly contribute to

(*b*) Sabatier, Med. Opérat. T. I. pag. 87. Bertrandi, opere chirurgiche, pag. 170. Schmucker, in Richter's Traité des hernies, pag. 111. Lobstein, dissert. de hern. congenita. Bell, System of Surgery, T. 1.

* Sternal aspect.

(*c*) Fardeau, Journ. gén. de méd. par Sedillot, T. xv. pag. 401.

illustrate this point of practical surgery. It is stated, that in operating on an incarcerated and large scrotal hernia, after the first incision, an elevated vascular cord presented itself upon the hernial sac, which in a spiral manner turned round the tumor from behind forwards*, and from above downwards†, to the bottom of the hernia. The skilful operator suspected that this vascular band was formed by the vessels of the spermatic cord, although situated upon the anterior surface‡ and sides of the hernia, remembering, without doubt, the observation of Ledran *(d)*, and he assured himself of the fact by compressing the *vas deferens*, which he thought he could distinguish, from the pressure of which the patient complained of the same uneasy sensation he felt on compressing the *vas deferens* of the other testicle. The hernial sac was opened, keeping the incision, with the greatest care, to the longitudinal axis of the tumor, in order to avoid wounding the vascular cord. After the viscera were returned into the abdomen, the scrotum and hernial sac contracting, the vessels of the spermatic cord and of the testicle regained their natural position§ behind the sac, and the patient was indebted to the judgment

* From the dorsal to the sternal aspect.

† From the atlantal sacrad. ‡ Sternal aspect.

(*d*) Traité des opérat. pag. 127.

§ Dorsad of.

and attention of the surgeon for the cure of the hernia, and the preservation of the testicle of that side.

§ 3. With regard to the mode of proceeding in opening the hernial sac, some writers on surgery direct it to be divided layer after layer, others make the incision with one stroke of the knife. Louis was of this opinion (*e*). He encouraged surgeons to lay bare the protruded viscera in hernia by two incisions only, the one through the integuments of the scrotum, the other into the hernial sac. The extreme circumspection of the former, and the rash confidence of the latter, arise in my opinion from the same cause, viz. the imperfection of their pathological knowledge with regard to the true number of the coverings of scrotal hernia, and of the various changes produced in these coverings, according as the scrotal hernia is small and recent, or very large and of long standing. It was an error in these authors to include under the name of hernial sac, what pathological anatomy shows to be composed of several concentric sacs, viz. the aponeurosis of the fascia-lata, the sheath of the cremaster muscle, the cellular substance exterior* to the peritoneum, and the hernial sac, properly so called. On which account they were

(*e*) Mémoires de l'Acad. R. de chirug. T. xi. p. 453.

* Peripherad of.

mistaken when they ascribed to an increased density of the hernial sac formed by the peritoneum, what was occasioned by the thickening of the aponeurotic web of the fascia-lata, of the sheath of the cremaster muscle, and of the cellular substance situated between the cremaster and the true hernial sac. And it is surprising how they could restrict the number of these parts to one only, while they did not cease to repeat, that in operating on large and old scrotal hernia, a number of membranous coverings are always met with *(f)*, and many capsules distinct from one another, resembling, at every cut, the hernial sac, as if these coverings had been of recent formation, and as if the hernial sac formed by the peritoneum, had not peculiar and evident characters, by which it is readily distinguished from the other membranous and aponeurotic coverings lying over the hernia. For, as I have shown in the preceding memoir, the hernial sac, properly so called, at all the periods of scrotal hernia preserves nearly the same density and transparency, as the peri-

(f) Sabatier Méd. opérat. T. 1. pag. 75. On trouve quelquefois plusieurs feuillets les uns au-dessus des autres avant de pénétrer en dedans du sac, sur-tout si l'hernie est ancienne. Ces feuillets sont séparés par un vide, qu'on pourroit prendre pour la cavité, dans laquelle les intestins sont contenus, si on n'en étoit prévenu; j'ai vu des gens habiles, à qui cette disposition paroissoit embarrassante, hesiter à couper les feuillets les plus profonds, de peur d'entamer les intestins.

toneum in the cavity of the abdomen, with the exception of some points, where from the long pressure caused by the viscera, or from previous inflammation, the hernial sac has contracted adhesions with the surrounding cellular substance, or with the viscera contained in it, as most commonly happens with the omentum. In scrotal hernia of moderate size, the cellular substance which accompanies the peritoneum out of the abdomen, and which is interposed between the sheath of the cremaster muscle and the hernial sac (*g*), is merely a soft and smooth cellular substance. In large and old scrotal hernia, on the contrary, this same cellular substance is dense and compact, and apparently composed of many layers. The aponeurotic sheath of the cremaster (*h*), also acquires in old herniæ a hardness and thickness much greater than usual. On which account, in both cases, pathological anatomy teaches us, that we ought to proceed very cautiously in making the opening into the hernial sac, in order to lay bare the viscera contained in it without wounding them; for in scrotal hernia of moderate size and not of long standing, after dividing the sheath of the cremaster with the hand unsupported, there will present immediately under it* the soft cel-

(*g*) Plate II. h. h.

(*h*) Id. g. g. e. e. f.

* Centrad of it.

lular substance which accompanies the peritoneum through the inguinal ring, and after raising and dividing it, the true sac formed by the peritoneum will shine through. And in the second case of large and old scrotal hernia, as it will be impossible to determine in every individual the degree of thickness and depth of the cellular substance interposed between the sheath of the cremaster and the hernial sac, it will always be prudent for the surgeon to proceed cautiously in similar circumstances, raising with the forceps and pointed director, and dividing, layer after layer, the firm cellular substance lying under the sheath of the cremaster, until there appears in the bottom of the incision the transparent membrane which constitutes the true hernial sac formed by the peritoneum. Whoever shall deviate from this rule, will run the risk, in the first case, of plunging the knife in upon the viscera, and in the second, of taking for the hernial sac the firm and thick cellular substance with which it is covered.

§ 4. After opening the sac, the principal intention of the operation, every one knows, is to free the viscera from the strangulation with safety and expedition, and to return them into the abdomen. With regard to this point, if in every case of incarcerated inguinal or scrotal hernia, the only obstacle to the return of the viscera was the absolute and relative stricture of the inguinal ring,

compared with the bulk of the protruded viscera, this part of the operation would not only be the most easily performed, but likewise the most exempt from danger to the patient; as it would be required, for replacing quickly the protruded viscera in the abdomen, merely to make an incision into, or rather to scratch deeply from without inwards* the tendinous pillar of the inguinal ring, and on it being relaxed, the viscera would, as it were spontaneously, retire into the cavity of the abdomen. And this practice would the more deserve to be recommended, as, besides several other important advantages, it would always insure that of the epigastric artery never being injured in the division of the inguinal ring, whether this artery remained in its natural situation in the formation of the inguinal hernia, or was removed, as most commonly happens on the back part† of the neck of the hernial sac, from the external to the internal side‡ of the ring. But observation and experience have demonstrated, that much more frequently than has been hitherto supposed, or is believed by surgeons in general, the strangulation of the viscera depends less on the tendinous pillars of the ring, than upon the excessive straitness and rigidity of the neck of the hernial sac, and that therefore it would be always the best advice to divide the neck of the

* From the dermal to the central aspect.

† Dorsal aspect. ‡ From the lateral to the mesial aspect.

hernial sac at the same time with the inguinal ring, when it is desired to free the viscera protruded in the groin from the strangulation with safety and expedition. It cannot be denied, that in doing this, the accident chiefly to be dreaded is the injury of the epigastric artery; but upon this point it will be from this time forward a proof of the perfection of the art, to fix the conduct of the surgeon by an invariable rule, and enable him to avoid in all cases this very great misfortune, whether the epigastric artery be found on the one or on the other side of the neck of the hernial sac and of the inguinal ring. Günz, indeed wrote (*i*), that the fears of those surgeons were vain and ill founded, who thought that it was possible for this artery to be included in the incision of an incarcerated inguinal hernia. Camper (*k*) said the same, and several other celebrated writers on surgery have paid so little attention to the danger of wounding this artery, in dividing the inguinal ring, that in describing this operation, they have not even mentioned it; among the number of these writers are Louis (*l*), Hevermann (*m*), Callisen (*n*), Bell (*o*),

(*i*) Libellus de herniis, pag. 52.

(*k*) Demonstrat. anat. patholog. Lib. 11. pag. 5.

(*l*) Acad. R. de chirurg. T. xi.

(*m*) Chirurgische operat. 1. Band.

(*n*) Institut. chirurg.

(*o*) A System of Surgery, vol. 1.

Wilmer (*p*). In spite of these great authorities, I have had the misfortune to be an eye-witness of this severe and irreparable accident supervening upon an operation performed in a dextrous manner, and with the greatest facility. And it is proper to mention that Bertrandi had repeatedly occasion to observe the same occurrence, as he writes (*q*): *I can affirm that I have opened the bodies of men who have died a few hours after this operation, although performed with great facility, dexterity, and quickness, so that the operators thought highly of themselves on that account; and they were quite astonished and could not comprehend the cause of so unexpected death; but their astonishment ceased when they saw the abdomen full of blood, discharged from this artery* (the epigastric) *wounded.* Leblanc (*r*) likewise wrote that this error had been committed by surgeons in other respects very expert. And what renders this hemorrhage the more formidable, is, that in order to stop it, no confidence can be placed in the needles proposed by Arnaud, in the instrument described by Chopart, in the forceps of Schindler (*s*), and other similar very imperfect means; for the depth at which the epigastric artery is situated, prevents the instruments being

(*p*) Practical observations on Hernia.

(*q*) Trattato delle operazioni.

(*r*) Précis d'opérat. T. II. pag. 129.

(*s*) De Herniis observationes.

applied to the place of the injury, and because the effusion of blood into the cavity of the abdomen takes place imperceptibly, without there being externally a charactersistic mark sufficiently evident; so that, on the first appearance of symptoms of extravasation of blood into the abdomen, it is already too late to remedy it, although there were even means actually prepared and effectual for stopping the canal of the wounded epigastric artery.

§ 5. In a matter of fact, and of so great importance as are the position and direction which the epigastric artery assumes with respect to the neck of the hernial sac and to the inguinal ring, it would appear that there ought not to be any dispute between the masters of the art, and that therefore there ought to be only one opinion with regard to the direction to be given to the division of the inguinal ring and of the neck of the hernial sac, in order always to avoid the wounding of this artery in the act of removing the immediate cause of the strangulation of the viscera. Yet Garengeot, Lafaye, Sharp, Pott, Chopart, Dessault, Sabatier, direct that the incision of the inguinal ring be inclined *outwards**, or towards the ilium, while Heister, Platner, Schacher, Bertrandi, Mehrenheim, Richter, and several others among the modern surgeons, think that the division of the inguinal

* Atlantad and laterad.

ring ought to be made *inwards* and upwards*, or towards the pubes and the *linea alba.* This diversity of doctrine among men of so great knowledge and experience, had for a long time induced some versed in these matters to suspect, that there ought in fact to be a variety and inconstancy on the point of the position and direction of the epigastric artery, with regard to persons affected with inguinal hernia, upon which varieties each of the above quoted authors had founded his opinion; which conclusion I have found to be perfectly true and confirmed by facts. For, although in most cases in the formation of inguinal hernia, the neck of the hernial sac makes the epigastric artery change its direction from the outer towards the inner side† of the inguinal ring (*t*), yet in some cases, however rare they may be, this artery retains its natural position and direction (*u*) along the outer side‡ of the ring and of the neck of the hernial sac; this circumstance occurs whenever the first appearance of the inguinal hernia is observed opposite to the inguinal ring, on the inner side§ of the place where the spermatic cord passes over¶ the epigastric

* Atlantad and Mesiad.

† From the lateral to the Mesial aspect.

(*t*) Plate II. 4. 5.

(*u*) Pl. I. 5. 6.

‡ Lateral aspect. § Mesial aspect. ¶ Dermad of.

artery (*x*). But before undertaking the operation, it is almost never possible to learn precisely from the patient, whether the inguinal hernia at its commencement has passed in an oblique line in the bend of the thigh from the side to the pubes, or if it has made its appearance directly opposite to the inguinal ring on the inner side* of the intersection of the spermatic cord and the epigastric artery, from whence it might be inferred, that this artery is situated on the inner or outer† side of the neck of the sac and of the inguinal ring. Dessault and Chopart (*y*) have remarked, with much accuracy and truth, that when, on opening an inguinal or scrotal hernia, it is found that the spermatic cord lies on the external side‡ of the tumor (*z*), the epigastric artery is likewise situated there, and *vice versa;* as this in fact is the situation and direction of these vessels in all those inguinal herniæ which protrude directly opposite to the ring. Nevertheless, in the act of operating, the effusion of blood, the separation of the protruded viscera, which is made in order to ascertain the precise place and the degree of the strangulation, render this point of diagnosis difficult and full of doubt, at least to young surgeons. On

(*x*) Memoir I. § 25. 26.

(*y*) Traité des maladies chirurg. T. 1. pag. 263.

* Mesial aspect.

† Mesial or lateral aspect. ‡ Lateral aspect.

(*z*) Pl. I.

which account, on this important point of practice, every one, I imagine, will be of opinion, that the most prudent and safe method of removing the strangulation of the viscera, will be to give such a direction to the division of the ring, and of the neck of the sac, as shall guard the epigastric artery from injury in every case, whether it is situated on the external or internal side * of these parts. This will be always obtained by prolonging the division of the ring, and of the neck of the hernial sac, in a line parallel to the *linea alba* (*a*), so that the incision forms a right angle with the horizontal ramus of the pubes, and this incision should be always small, and not caused by those long cuts very improperly practised by some surgeons, which are never necessary for obtaining the replacement of the protruded viscera. This rule is the result of the examination of several dead bodies of men affected with hernia, in some of which the epigastric artery was situated on the outer side †, in others on the inner side ‡ of the neck of the hernial sac, and of the inguinal ring; in all of which, having drawn a line parallel to the *linea alba*, I have observed, that following, with the knife, the mark

* The lateral or mesial aspect.

(*a*) Pl. I. II. See the dotted lines.

† Lateral aspect. ‡ Mesial aspect.

pointed out by the line, the epigastric artery remained uninjured, although the incision was extended an inch above * the inguinal ring.

§ 6. With regard to the immediate cause of the strangulation of inguinal hernia, there was for a long time only one opinion among surgeons, viz. that this accident was produced sometimes by a spasmodic constriction of the inguinal ring, and sometimes by a sudden increase of bulk of the protruded viscera, disproportioned to the width of the tendinous ring through which they had passed downwards †. Riverius (*b*), Shenckius (*c*), Littre (*d*), Nuck (*e*), were the first who began to suspect, that sometimes the strangulation of the viscera in hernia, depended less on the absolute and relative straitness of the inguinal ring, than on the diminished capacity of the neck of the hernial sac gradually supervening, especially in inguinal hernia not of very large size, nor of long standing. Le Dran *(f)* confirmed this fact, by a considerable number of practical observations, and since

* Atlantad of. † Sacrad.

(*b*) Ephem. n. c. decad. 1. an. ix. x. obs. 93.

(*c*) Hist. de l'Acad. R. des sciences de Paris, an 1708.

(*d*) Adenograph. pag. 76.

(*e*) Obs. de chirurg. T. II.

(*f*) Obs. de chirurg. T. II.

his time, the histories of incarcerated herniæ, strangulated by the neck of the hernial sac, independent of the inguinal ring, have increased so much in number, that it now appears, that this immediate cause of strangulation of hernia, ought with great propriety to be considered no longer as a rare accident, but rather as one of the very frequent causes of this complication of the disease. And it is not difficult to account for this truth having for so long a period been delayed appearing in the clearest light, although very important to be known in the practice of surgery. For there have been very few surgeons in every age, who have thought of examining, in the dead bodies of persons labouring under hernia, the relations between the hernial sac and the ring, and between these parts and the bulk of the protruded viscera; and because in every variety of incarcerated hernia, the most experienced practitioners have always divided the neck of the hernial sac at the same time with the inguinal ring; so that the true cause of the strangulation existing in the neck of the hernial sac, passed unobserved.

§ 7. In the numerous dead bodies of hernial patients which I have examined, some of which were affected with *common* scrotal hernia, others with *congenital*, I have found several, in which the neck of the hernial sac was evidently in a state approaching to become the immediate cause

of the strangulation of the protruded viscera (*g*), while the inguinal ring, much dilated and flaccid, would have only opposed a weak resistance to the farther protrusion and increase of the viscera in the hernia. I never observed any such appearance in the bodies of those in which the scrotal hernia was very large and of long standing, with a great quantity of water in the sac and in the abdomen, or in very old persons, who during their life had never made use of a bandage. It was particularly in the bodies of middle aged men, and in those in whom the scrotal hernia was of moderate size, and who had worn a bad bandage and irregularly, that I have more frequently than in any others met with the neck of the hernial sac considerably straitened, hard in the vicinity of the margin of the ring, and opposing a much greater resistance to the distension than the inguinal ring. And in these subjects, I have had occasion to remark, that the hernial sac in its passage through the inguinal ring, sometimes forms a neck or tube about an inch in length, sometimes simply a stricture (*h*), as in the annexed figure, over which ligature or stricture the fleshy fibres of the cremaster muscle were firmly applied, and these fibres were likewise rigid and sometimes almost coriaceous, together with the subjacent cellular substance

(*g*) Plate IV.

(*h*) Pl. IV. d. d. c. c.

accompanying the peritoneum, which was also indurated and dry. These superincumbent parts, hard and callous, contribute greatly to increase the resistance which the neck of the hernial sac opposes to the dilatation of the aperture through which the viscera have descended into the scrotum. In fact, in the bodies of the persons here spoken of, on introducing the *dilator* of Leblanc, between the neck of the hernial sac and the inguinal ring, I did not experience any considerable difficulty in separating the tendinous pillars of the inguinal ring, and, on the contrary, I met with very great difficulty on attempting to dilate with the same instrument the neck of the hernial sac opposite to the place of the ligature or stricture. I had an opportunity of proving the truth of this fact, in the dead body of a man who died in consequence of the violence of the strangulation, produced by the neck of the hernial sac on a small loop of intestine protruded in the groin (*i*). In this subject, I found the inguinal ring wide and easily distended, while the neck of the hernial sac kept the small loop of intestine (*k*) quite tight and strangulated, and opposed a considerable resistance to the dilating instrument. The circular ligature formed by the neck of the sac was about four lines in width, and was evidently thickened by the addition of the

(*i*) Pl. XI. fig. 2. d. c.
(*k*) Id. h. h.

firm cellular substance which accompanies the peritoneum, and by the rigid and coriaceous fleshy fibres of the cremaster muscle.

§ 8. In general, there is a well marked difference between the degree of consistence and elasticity, in the natural state, of the aponeurosis of the *external* oblique muscle around the ring in a healthy man, and in the same aponeurosis in a man affected with hernia. Before the viscera open for themselves a passage through the inguinal ring, they have already evidently weakened and relaxed the portion of this aponeurosis, extending from the side to the inguinal ring, consequently, the hernia is preceded by an unusual swelling in the bend of the thigh, from the ilium to the groin, which swelling shows the degree of weakening induced by the impulse of the viscera against the superior aponeurotic pillar of the ring, and this weakening goes on gradually increasing, in proportion as the hernia enlarges. The reverse of this takes place with regard to the hernial sac. For, in proportion as the sac of the hernia, from the weight of the viscera, is drawn downwards * into the scrotum, its neck becomes wrinkled and corrugated; and if at the same time the neck of the sac is compressed between the edges of the ring by the pad of a bandage, ill constructed or im-

* Sacrad.

properly applied, the neck of the hernial sac assumes a tendency to contract, as well as to become thickened at that part, in consequence of the induration produced by the pressure on the superincumbent cellular substance, and on the adjacent fleshy fibres of the cremaster muscle. To these causes of constriction, may be added a certain natural tendency which the protruded peritoneum has to contract. This contractile power is evident in the tunica vaginalis testis, in the fetus after the descent of the testicle, and is likewise proved by what is observed very frequently in *common* recent hernia accurately returned, and kept constantly reduced for a long time, in which the neck of the sac not only contracts spontaneously, but even closes entirely. And to this tendency to contraction of the neck of the sac, is likewise to be ascribed what we see frequently occur in omental hernia, which from being of a cylindrical form at first, gradually changes into a pyramidal tumor, broad at the lower part, and narrow at the top like a pedicle. And it is not a rare circumstance, to find in the hernial sac a portion of intestine having the impression of the stricture produced by the gradual and insensibly increased constriction of the neck of the sac, although not preceded by inflammation or any other severe symptoms. I have in fact preserved a scrotal hernia of the left side formed by the colon, which at the place corresponding to the

neck of the hernial sac, is scarcely large enough to admit the middle finger, although the patient in whom this hernia was observed had never been threatened, as far as I was able to learn, with symptoms of inflammation or incarceration. In this patient, the inguinal ring was flaccid and yielding, and the neck of the hernial sac, on the contrary, contracted, rigid, and surrounded by a circle of hard and coriaceous substance. Farther, it is a well known fact in practical surgery, that herniæ kept carefully reduced for a long time, if unfortunately they re-appear during a violent exertion, are always of a smaller size than they were before their replacement, but are more readily subjected to incarceration than before; not because, in similar cases, the tendinous pillars of the inguinal ring have re-acquired their original natural consistence and elasticity, as that change is never observed to take place in tendinous and aponeurotic parts, which have been insensibly distended and weakened, but solely because, during the time of the complete and constant reduction of the protruded viscera into the abdomen, the neck of the hernial sac has had every opportunity of contracting.

§ 9. Pott(*l*) and Wilmer(*m*) were of opinion, that *congenital* inguinal hernia is subject to be strangu-

(*l*) Chirurg. Works, T. iii. p. 292.

(*m*) Practical observ. on herniæ, p. 3.

lated by the neck of the sac, more frequently than *common* inguinal hernia. Wilmer said, that of five *congenital* herniæ on which he operated, three were strangulated by the neck of the hernial sac, and not by the inguinal ring. Sandifort (*n*) observed the same species of strangulation in the dead body of a young man, on whom the operation for *congenital* inguinal hernia had been performed without success, because the surgeon had neglected to divide the neck of the hernial sac along with the inguinal ring, the principal, and in this case, the immediate cause of the strangulation. From all that I have been able to remark in my own practice, and from the examination of many bodies of men affected with hernia, I am not enabled to deduce a computation sufficiently demonstrative, to deny or confirm the opinion of the above mentioned authors, with regard to the greater frequency of the strangulation, produced by the neck of the sac in *congenital* than in *common* hernia. I am however disposed to believe, that they are not far from the truth, as it appears to

(*n*) Museum anat. acad ; Lugdun. vol. II. Tab. 91, 92.—Fissura obliqui externi erat admodum ampla, imo digiti apicem ante tumorem admittebat ; repelli tamen elapsæ partes non poterant. Saccus herniæ, ad pollicem circiter supra fissuram obliqui, originem ex peritonæo trahebat, sic ut in hoc loco canalis quasi ad inguen descendebat, qui contentis distensus prominentiam ante memoratam supra fissuram illam produxerat.

me probable, that in *congenital* hernia, the neck of the vaginal coat ought to be more liable to become obliterated, and to retain a greater natural tendency to contract, than that which the portion of the great peritoneal covering can have, which descends, in the diseased state, to form the sac of the *common* inguinal hernia. I can however assert, and it is the result of a great number of facts on this subject, that of the two species of stricture of the neck of the sac, the one, in the form of a narrow tube, extending obliquely from the inguinal ring towards the side, the other in the manner of a belt or stricture of the edges of the inguinal ring, the first is met with more frequently in *congenital* than in *common* inguinal hernia.

§ 10. The constriction of the hernial sac not only occurs at its neck, but sometimes even in its body without* the inguinal ring, sometimes at the middle, sometimes in the vicinity of the bottom of the sac; a rare circumstance, indeed, but when it is met with, it may very much embarrass a surgeon who is not aware of the possibility of this complication. In operating for incarcerated inguinal hernia, I have met with three cases of this kind, two of which were *congenital* and one *common* hernia. I have once only had an

* Peripherad of.

opportunity of seeing this species of constriction of the body of the sac in the dead body of a hernial patient, from which I have taken the annexed figure (*o*). In this subject the hernial sac, towards its middle, was observed separated into two sacs, disposed in two planes one* above the other (*p*). Between the two sacs, there was a hard margin elevated like a ring (*q*), apparently formed by a doubling of the sac, which left a round aperture of communication between these two sacs, the upper† of which (*r*) was larger and deeper than the lower‡. Both of the sacs were filled by a loop of small intestine of unequal length. It was not difficult in the dead body to draw up the larger portion of the intestinal loop occupying the upper§ sac, and make it pass into the abdomen; but as soon as I began to draw back the portion of intestine which had descended into the lower‖ sac, I met with difficulty in making it recede through the opening of communication between the two sacs. Having returned both of the loops

(*o*) Plate V. fig. II.

* Atlantad of.

(*p*) Idem, c. f.

(*q*) Idem, d. d.

† Atlantal.

(*r*) Idem, e. g. g.

‡ Sacral. § Atlantal. ‖ The more sacral.

of intestine into the abdomen, on passing a finger down through the stricture into the inferior* sac (*s*), I found that the finger descended so low down into the scrotum as to be concealed behind† the testicle. In the writers on this subject, we find mention made of a double and triple constriction of the hernial sac, at different distances, in the course of the scrotal hernia. Arnaud (*t*), Reiley (*u*), Hoin (*x*), Sandifort (*y*), Mohrenheim (*z*), Gaulmin (*a*), speak distinctly of this. Arnaud was of opinion, that the constriction of the body of the hernial sac, is, properly speaking, only the stricture of the neck of the sac itself, which point of constriction, as the hernia increases, descends gradually farther below‡ the inguinal ring, and that the same arrangement of parts is renewed in those cases in which several constrictions

* Sacral. † Dorsad of.

(*s*) Pl. V. fig. 2. f. h. h.

(*t*) Dissert. on Herniæ, pag. 362. The author here gives a figure of a hernial sac constricted at two places at the distance of six inches from each other.

(*u*) Pott. loc. cit. p. 293.

(*x*) Leblanc, Précis de chirurg. T. II. pag. 124.

(*y*) Museum patholog. ; Lugdun. Tab. 91. 92.

(*z*) Beobachtungen—Erster Band.

(*a*) Journal de méd. de Paris, T. xxxv. pag. 81. Le péritoine formoit cinque brides, qui, d'espace en espace, étrangloient l'intestin.

† Sacrad of.

are found in the whole length of the hernial sac. But this conjecture is not supported by any certain and demonstrated fact. If it were true, as has been asserted by some surgeons, that this constriction of the body of the sac was only met with in *congenital* inguinal hernia, a plausible explanation of this phenomenon might be deduced from the observations of Camper on the natural form of the vaginal coat in the fetus, which, as he has remarked, when inflated with air, is raised irregularly, and presents in its course one or more natural constrictions (*b*), which, in persons affected with hernia, not having been obliterated by the distension of the protruded viscera, would retain their original form of one or more constrictions. But however probable this might appear with regard to *congenital* hernia, it is not sufficient to illustrate the cause of this phenomenon in *common* inguinal hernia.

§ 11. The marks, by means of which we may at least strongly suspect, if not positively assert, that the immediate cause of the strangulation depends on the neck of the hernial sac rather than on the inguinal ring, are the following:—If the hernia has existed from infancy or from early youth, and was scrotal at its first appearance, to use the expression, without stopping in the

(*b*) Icones herniarum, Tab. x. fig. II. III. and IV.

groin a little below* the ring; if the hernia has been retained for a long time by means of a well adapted truss, then having been left to itself, has re-appeared suddenly during a violent exertion made by the patient; if at the upper† part of the incarcerated hernia we do not feel with the point of the finger the margin of the ring rigid, tense, and closely embracing the viscera; if the hernia, under the attempts made by the surgeon for its replacement, has been partly returned and has partly remained without ‡, and an unnatural swelling is seen and felt by the touch above§ the inguinal ring which was not there before, and if the patient complains of the same exquisite sensibility, whether pressure be made on the swelling which is above ‖, or on that which is below¶ the inguinal ring; if, on placing the patient on his feet and making him cough, the upper** tumor disappears, and the hernia regains the situation and bulk which it had before the attempts were made for its replacement. If these symptoms are observed, there is every reason to believe, that the immediate cause of the strangulation is not to be ascribed to the inguinal ring, but to the neck of the hernial sac.

Therefore, in similar circumstances the surgeon will proceed very cautiously in employing the means for reduction, or will desist entirely from the practice of them, and proceed as quickly

* Sacrad of. † Atlantal. ‡ Peripherad. § Atlantad of.
‖ Atlantad. ¶ Sacrad of. ** Atlantal.

as possible to the operation. For, if the hernia strangulated by the neck of the sac, is small and recent, as in this case the inguinal ring does not oppose any considerable resistance to the return of the viscera, and as the fibres of the cellular substance uniting the hernial sac to the neighbouring parts, permit the hernial sac to be pushed back and rolled up* between the edges of the ring and beyond† the ring, it may readily happen, that during the repeated attempts at reduction, the small hernia may actually disappear from the groin, and the surgeon supposes that he has completely reduced it, while soon after he is informed of the contrary, by the symptoms of strangulation, instead of ceasing, becoming more violent than before, under the violence of which, if the surgeon persists in his error, the patient expires. I saw this happen very lately in a boy, thirteen years of age, in whom all the symptoms of incarcerated hernia continued, although it had been completely reduced, as far as could be judged by the sight and touch. And in fact, in the dead body of this boy there was not externally the smallest appearance of tumor in the inguinal region. But on opening the abdomen, it was immediately discovered that the intestine, still strangulated by the neck of the hernial sac, had been pushed up along with the sac beyond‡ the ring, where it was seen

* Atlantad. † Atlantad of. ‡ Atlantad of.

rolled up between the aponeurotic parietes of the abdomen and the great sac of the peritoneum.

§ 12. In similar cases, which it is proper to repeat are very frequent in practice, if, in the act of operating, an inattentive and hurried operator only turns his attention to the inguinal ring as the immediate and sole cause of the strangulation, and insinuates incautiously the grooved sound between the neck of the hernial sac and the ring, after making the incision of it, he will find himself not less embarrassed than before the incision, and astonished at the great difficulty which he will meet with in the act of attempting to return the viscera into the abdomen. And if the loop of intestine is small, he will run the risk of committing a worse error than the first, viz. of returning and concealing it beyond the ring, in the false persuasion of having freed it from the strangulation, when he has only rolled it up and forced it into a narrow recess between the inguinal ring and the great sac of the peritoneum, in the direction from the pubes to the ilium. On which account, in every case of incarcerated hernia, but more particularly in those in which there is reason to suppose that the strangulation depends upon the neck of the hernial sac, the surgeon will lay down, as an invariable rule, to raise with one hand the edge of the hernial sac in the vicinity of the ring, while he passes with the other the

grooved probe, paying the most particular attention that the probe, on which he proposes to divide all that prevents the reduction, passes cautiously between the protruded viscera and the neck of the hernial sac. And if, notwithstanding this attention, after making the incision, the operator has not succeeded in dividing the neck of the sac through its whole length, since, as has been already mentioned, this straitened membranous tube sometimes extends half an inch or an inch beyond * the inguinal ring; he will perceive the insufficiency of the incision, by means of the introduction of the point of his finger, with which he will feel distinctly a stricture at the upper † part of the neck of the sac, and he will observe, that the viscera are stopped by a sort of membranous web, which will prevent him passing his finger into the cavity of the abdomen, and turning it freely in every direction. Then being aware of what retards the finishing of the operation, he will make the viscera again protrude gently, and drawing them cautiously towards him, he will see them pass out ‡ together with the neck of the hernial sac inverted over § them like the finger of a glove, and will clearly distinguish the precise place where the neck of the sac continues to act as a stricture. Then he will again pass a fine grooved probe, between the inverted and rounded

* Atlantad of. † Atlantal. ‡ Peripherad. § Peripherad of.

edge of the neck of the sac and the strangulated viscus, and with a blunt pointed bistoury, he will divide on it the remains of the neck of the sac which opposes the free and complete reduction of the protruded parts. This practice proves likewise equally useful and easily performed, when, from inadvertence, as has been mentioned a little before, the inguinal ring only has been divided, the neck of the sac remaining untouched, the principal and immediate cause of the strangulation. And if I may be permitted to judge from my own experience, this practice appears to me, from the facility and safety of the operation, to be preferable to that of carrying an incision along the probe or finger * so high up into the abdomen, without the assistance of the eye, as the length of the narrow membranous tube formed by the neck of the hernial sac. I do not mean however to discountenance this practice entirely, but merely to say, that it might be reserved for those rare cases in which the length and depth of the neck of the sac is such, that after the incision of the inguinal ring, the surgeon does not succeed in drawing out gently the viscera improperly returned with the neck of the hernial sac, and in inverting it, so as to have a complete view of the precise place of the strangulation (*b*).

* So far atlantad.

(*b*) When the stricture cannot be drawn out, or when it is formed by the edge of the transversalis muscle or its fascia, a

§ 13. With regard to the strictures produced by the body of the hernial sac, situated at different distances from one another, from below * the inguinal ring towards the bottom of the scrotum, these belts in general pass unobserved before the operation, as the irregularity met with in the external form of the tumor may be presumed, for the most part, to arise from the irregular shape of the parts contained in the hernia, especially of the omentum. Fortunately, this species of stricture of the body of the sac shows itself distinctly after the sheath of the cremaster is opened, and in the very act of proceeding to lay bare the viscera. And it may then be perfectly well ascertained, on introducing the finger within the opened hernial sac † above and below the stricture, and on observing externally ‡ opposite to these strictures as many furrows or depressions in the body of the hernia, which do not leave any doubt with regard to the nature and species of the complication. These constrictions are easily divided and with perfect safety, by passing a

probe-pointed bistoury is to be introduced lying flat on the finger, previously passed up to the seat of the stricture, which is then to be divided by cautiously turning round the edge of the knife, and pressing it against the stricture in a direction sternad and atlantad. The bistoury should have a cutting edge only about an inch in length from its point. *T.*

* Sacrad of. † Sacrad and atlantad of. ‡ Peripherad.

probe-pointed bistoury between the viscera and the hernial sac, along the point of the finger or of a grooved probe, directing it from above downwards, or from below upwards *, as is most convenient for the operator, or according as the hernial sac has been first opened above or below † the constriction.

§ 14. Among the causes producing the strangulation of the viscera in hernia, writers of surgery justly reckon the twisting of the bowels, and that formed by the omentum around the intestine in the manner of a tight ligature. With regard to the first of these two species of strangulation, I have already mentioned in the preceeding Memoir (*c*), that repeatedly in unfolding the protruded loop of intestine, in the dead body of patients affected with hernia, I have been deceived in calling that which was the inferior, superior portion of the alimentary canal, or corresponding to the stomach, and *vice versa*. After farther researches on this subject, I have ascertained, that much more frequently than is commonly supposed, the intestinal canal is found in hernia twisted in the form of the figure 8, whether this takes place, as I

* From the atlantal aspect sacrad, or from the sacral aspect atlantad.

† Atlantad or sacrad of.

(*c*) § 30

have said in another place, in the act of descent of the intestine, or that the intestine gradually assumes this position after the hernia has become very large. Whatever be the state of this fact, there is no doubt, that although the contents which pass along the small intestinal canal, are in general quite fluid, there is no reason why in patients with hernia, in whom such a twisting exists, it may not sometimes happen, that, from an unusually abundant disengagement of flatulence, from an excessive afflux of feculent matter in the hernia, from accumulation of worms, or from fragments of indigested substances, the natural course of the aliments may be restrained, and even obstructed, beyond * that twisting of the intestinal canal. For, the superior † portion of the loop corresponding to the stomach, if it is situated behind ‡ the inferior § portion which it crosses, raises and compresses it; from which, symptoms of strangulation arise, not ascribable, properly speaking, to the neck of the sac or to the inguinal ring, but, if they continue, rendering the operation for hernia necessary.

§ 15. Dangerous consequences, similar to these, are not unfrequently occasioned by the omentum which may be twisted round the intestine in various ways. Of these there are considerable varie-

* Atlantad of † Atlantal. ‡ Dorsad of. § Sacral.

ties. I propose, at present, only to lay before my readers those which I have had occasion to observe in practice, and to examine in the dead bodies of hernial patients, conceiving them to be the principal, and to which all the varieties may be referred that may be met with in this kind of arrangement of parts. In the first place, the pedicle of the omentum in hernia, or the slenderest portion of this viscus, after passing through the inguinal ring (*d*), is sometimes converted into a small cord, which adheres firmly on one side to the neck of the hernial sac (*e*), then passes across * over the intestine (*f*), surrounds it for a certain space, and is united firmly at the opposite side to the posterior † part of the sac of the hernia (*g*). This portion of omentum which surrounds the intestine, acquires a consistence greater than natural, and presents an apparently fibrous texture; and although it does not completely surround the loop of intestine, yet on account of its firm adhesion to the two sides of the hernial sac (*h*), and its lying close upon the intestine, with which it sometimes contracts adhesions, it becomes an immediate cause of strangulation, whenever the diameter of the intestine is immoderately increased by an accumulation of air or of feculent matter, or if the

(*d*) Pl. V. fig. 1. (*e*) Ibid. b.

* Sternad of. † Dorsal.

(*f*) Ibid. d. (*g*) Ibid. f. e. (*h*) Pl. V. fig. 1. b. f. e.

volume of the hernia is increased by the descent of a greater portion of the same intestine.

On this subject, Arnaud (*i*) relates the history of a patient, which it is the more proper to introduce here, as the observation of this author has a great resemblance to the figure just quoted. "As "soon," he writes, "as the hernial sac was open- "ed, the omentum appeared in a healthy state, "so that it was supposed not to be connected "with any loop of intestine. I raised the omen- "tum, and then, a little below * the inguinal ring, "a small loop of ileum presented itself, as large "as a chesnut, red and inflamed. The inguinal "ring was found as much dilated as it would "have been after being divided in a case of incar- "cerated hernia, and yet the intestine was not "at all disposed to return. Each of the assistants "introduced his finger towards the upper † part "of the hernia, and was sensible, that there was "a circular band which strangulated the intestine "a little below ‡ the inguinal ring. It was re- "solved to draw out a larger portion of omen- "tum; which was easily done, as the omentum "was not at all adherent within the abdomen. "It was then seen very distinctly, that the omen- "tum, folded back § at the sides of the hernial sac,

(*i*) Mémoires de chirurg. T. 11. pag. 577.

* Sacrad of. † Atlantal. ‡ Sacrad of. § Atlantad.

" and towards the posterior* part, surrounded " for the space of half an inch, and strangulated " the intestine; and farther, the omentum had " contracted adhesions with the intestine in pas- " sing over† it. It was fortunate for the patient, " the author adds, that this adhesion did not " extend over the whole circumference of the " intestine, and therefore that it was possible to " introduce a grooved probe between the intestine " and the bridle formed by the omentum, which " was divided with a pair of scissars; after which " the intestine retired almost spontaneously into " the abdomen." From the whole of this account, there appears to be a great analogy between the case related, and the annexed figure representing this complication. Only in the body of the hernial patient which I examined, besides that the cord of omentum surrounded a greater portion of the circumference of the loop of intestine, than in the case just related, the omentum was not free between the edges of the ring; on the contrary, it adhered at that place very firmly to the inner side‡ of the neck of the hernial sac; farther, the omentum was not, properly speaking, adhering, but merely firmly applied over§ the intestine. However, if it even had been adhering, the safest and most speedy mode of free-

* Dorsal aspect. † Sternad of. ‡ Mesial. § Peripherad of.

ing the intestine from the incarceration, would have been the same as that employed by Arnaud, that is, the transverse incision of the cord formed by the omentum, at the place where the grooved probe would have found a free passage between the intestine and the omental bridle; and this rule is applicable to all the complications of this kind, however they may be varied.

§ 16. The second species of stricture produced by the omentum, is that in which the omentum, torn by the intestine, retires and arranges itself around the intestine, and embraces it closely in the manner of a ring. The omentum commonly lies above * the intestine in hernia. Farther, as I have mentioned in several places, the omentum has a singular tendency to contract adhesions with the sides and with the bottom of the hernial sac, sometimes in such a manner as to inclose the subjacent intestine, as it were, in a purse. In this arrangement of parts, and especially when the hernia is small, if during a violent exertion the intestine be forced violently against that fatty purse, the omentum is of consequence ruptured by it, and instead of the omentum the intestine presents first in the hernia. This accident is not unfrequent during the pains of labour in women affected with

* Dermad of.

umbilical entero-epiplocele. Baudelocque says (*k*), "I have been witness of the fatal consequences of "a similar accident. A fold of intestine, during the "exertions of labour, passed through the omentum "contained in an umbilical hernia, as large as a "hen's egg, and remained strangulated. The "woman was already attacked by severe symp-"toms of strangulated hernia, when I was called "in to assist her; which determined me to perform "the extraction of the fetus; but even after that, it "was impossible to return the intestine, as, with re-"spect to the omentum, it was known to be irre-"ducible, and it was not thought proper to try the "operation." But to return to inguinal hernia.

I found a similar arrangement of parts in dissecting a middle aged man who had an inguinal entero-epiplocele of the left side (*l*). It is proper to mention that the rupture in the omentum does not always happen suddenly, or if it do, this accident is not always immediately followed by strangulation of the intestine; for no such circumstance had occurred in the person just mentioned, although the hardness and thickness of the edges of the fissure of the omentum showed clearly that it was of long standing. I am of opinion, that sometimes the intestine pushed forcibly through

(*k*) L'Art des Accouchements, T. I. p. 509.

(*l*) Pl. VI. fig. 2.

the omentum, does not consequently become immediately strangulated, for soon after the laceration of the omentum, the greater part of the intestine violently protruded returns into the abdomen. On the other hand, in process of time, the fissure of the omentum, gradually applying more closely round the intestine, and its edges becoming thickened, becomes the immediate cause of strangulation, whenever the usual portion of intestine protruded acquires an uncommon bulk from the disengagement of air or accumulation of feculent matter. In the dead body, from which the annexed figure has been delineated, after opening the hernial sac, I found the fold of intestine denuded (*m*), surrounded by two bands of omentum (*n*), free towards the inguinal ring, and adhering closely to the sides and bottom of the hernial sac (*o*). The omentum in its passage through the ring, and through the neck of the hernial sac, formed a small cord; a fissure then appeared (*p*), through which a fold of the ileum had passed. The edges of this fissure were thick and hard, especially at the upper * part, corresponding to the inguinal ring (*q*). The two lateral portions of the omen-

(*m*) Pl. VI. fig. 2. d.

(*n*) Ibid, i. i. f. f. g. g.

(*o*) Ibid, f. f. g. g. h.

(*p*) Ibid, i. i. f. f. g. g. h.

(*q*) Ibid, fig. 2. a. i. i.

* Atlantal.

tum, which in the form of a circular belt inclosed the whole fold of intestine, were so firmly attached to the parietes and to the bottom of the sac, that it would have been impossible to separate them except by using the knife. The fold of intestine was not, properly speaking, strangulated, but in a state just about to become so, whenever any of the causes above mentioned had supervened.

Of similar complications in the actual state of incarceration, a very memorable case may be read in Arnaud's work, and another has been decribed by Callisen. "A man about fifty," says Arnaud (*r*), "strong and robust, was affected with "an inguinal hernia for a long time, which at last "became strangulated. The surgeon Bijet return-"ed the hernia, to all appearance, but the symptoms "of strangulation continued as before. The tumor "was made to re-appear in the groin, but the vio-"lence of the strangulation was not abated. Re-"course was then had to the operation, and on lay-"ing open the hernial sac, a fold of the ileum was "found lying over* the omentum. This unusual "position of the intestine over† the omentum was "a subject of surprise to all the assistants. The "operator raised the fold of intestine, and saw "that it had passed through a fissure in the "omentum, which fissure formed a belt of a com-

(*r*) Mémoires de chirurg. T. 11. p. 588.

* Dermad of.

† Dermad of.

" pact and inflamed substance, which constricted " the bowel circularly. The surgeon tore with " his fingers the fissure of the omentum, and re- " placed the intestine in the abdomen, although it " was very livid; he then tied and cut away the " portion of omentum which was found in the " hernial sac. In spite of the bad state of the " intestine, the patient recovered."

The event was not equally fortunate in the case observed by Callisen (*s*), although the manner of the complication was nearly the same as in the preceding case. " A woman had been troubled " for twenty four years with a femoral hernia, " about the size of a nut, without however hav- " ing ever thought of reducing it. After a great " supper, on making an exertion, the hernia became " incarcerated, and the usual assistance of art hav- " ing been found ineffectual, she submitted to the " operation. Within the hernial sac were found " two distinct portions of omentum, which at the " posterior* part of the hernial sac united into one " mass of a whitish colour, and almost of a car- " tilaginous consistence. A fold of intestine, " which was inflamed, had passed through the " bifurcation of the omentum, and the omentum " in many places had contracted adhesions with

(*s*) Acta Hafniensia, T. 1. pag. 164.

* Dorsal aspect.

" the hernial sac. By means of the *dilator* of " Leblanc, the fallopian ligament was dilated, but " nevertheless the intestine could not be reduced. " The ligament was then divided so far as to " allow the finger to be freely introduced into the " abdomen; but not even after that could the re- " placement be effected. It was then ascertain- " ed that the difficulty depended upon the edges " of the fissure of the omentum, which were the " only parts that strangulated the intestine. The " superior* angle of the fissure of the omentum " was therefore divided, and the incision was ex- " tended beyond† the fallopian ligament as far as " the abdomen; after which the intestine was push- " ed up‡, and the symptoms of strangulation abat- " ed. On the following day these symptoms were " more violent than before. Inferring from this, " that the immediate cause of the strangulation " had not been completely divided, the operator " removed the dressings, and introduced his finger " into the abdomen, but the distension of the in- " testines prevented him from discovering precisely " the place of the strangulation; and not long after " the patient died. On dissection, it was observed " that the omentum, gathered together towards the " left side of the abdomen, had advanced towards " the left fallopian ligament, and the portion of it

* Atlantal. † Atlantad of. ‡ Atlantad.

" protruded in the hernia, although the incision of " it had been carried within the abdomen, still " continued to constrict the intestine. The author " finishes by saying: *I was very much grieved to see,* " *that if I had extended the incision of the superior* " *angle of the fissure of the omentum one line more,* " *the intestine would have been freed completely from* " *the strangulation.*"

On examining all the circumstances of this case, and comparing them with those which I have represented in the annexed figure, it appears to me, that whenever such a complication is met with, the most speedy and safe plan to be adopted, is that of dividing transversely the two lateral bridles (*t*) of the omentum, forming the fissure through which the loop of intestine has passed. For, however closely the omentum may be applied to the intestine beyond * the ring or fallopian ligament, on cutting these bridles transversely in the vicinity of their adhesion to the hernial sac, they cannot any longer act as a stricture, although the portion of omentum cut away, retire along with the loop of intestine beyond † the ring or ligament, without the reach of the operator's finger.

(*t*) Plate VI. fig. 2. f. f. g. g.

* Centrad of. † Atlantad of.

§ 17. Another species of strangulation of the intestine occasioned by the omentum, is (*u*) where the omentum adhering to the neck, to the sides and bottom of the hernial sac, unites into a longitudinal bridle (*x*), which runs in the middle of the hernia from above downwards †, lies closely over ‡ the loop of intestine, and divides it into two parts (*y*), the one half passing to the right, the other to the left of the omental bridle. In this kind of complication, it is very difficult to effect the return of the intestine; because the fingers of the surgeon can only press on the intestine, on the one or other side of the longitudinal bridle formed by the omentum, and because, when one portion of the loop is compressed, the other swells more than before, without the whole mass of intestine, which has descended into the hernia, receding at all towards the cavity of the abdomen. And if in a case similar to this, from disengagement of air, from accumulation of feculent matter, or from the descent of a loop of intestine greater than can remain there uninjured, the two portions of the fold become unusually dilated and distend-

(*u*) Pl. VI. fig. 1.

(*x*) Ibid. f. f. e.

† From the atlantal to the sacral aspect. ‡ Dermad of.

(*y*) Ibid. f.

ed, the longitudinal bridle of the omentum (*z*) not being equally yielding as the intestine, apparently forms a fossa, but in fact constricts the intestine so strongly opposite to the attachment of the mesentery, and the posterior * part of the hernial sac, that strangulation is at last produced. In this species of incarcerated inguinal hernia, having laid bare the viscera, what the surgeon ought to do, to remove with quickness and safety the immediate cause of the stricture, is evidently suggested by the nature of the obstacle, and by what has been already said, viz. he should carefully pass a grooved probe transversely between the intestine and the longitudinal bridle formed by the omentum, on which he will divide the omental bridle transversely, as near as possible to its attachment to the bottom and sides of the hernial sac (*a*). He will then proceed to return the intestine; and if in doing it, he meets with any obstacle from the neck of the hernial sac or the inguinal ring, he will likewise divide these parts in the usual way.

§ 18. I had occasion to observe a singular species of incarceration of the intestine in inguinal hernia produced by the omentum, in the following case:—Joseph Mezzadra, a shoemaker,

(*z*) Pl. VI. fig. 1. f. (*a*) Pl. VI. fig. 1. e. e.

* Dorsal.

aged twenty, from five years of age had had a hernia in the right groin, which had frequently become incarcerated, and had been repeatedly reduced, but which, even after its reduction, had always occasioned him uneasiness at stomach, especially if he began to work with his stomach full. On the 21st September, 1806, after having eat a great quantity of pulse and grapes, while he was raising a heavy weight, the hernia became incarcerated with such a violent dragging in the region of the stomach, that it obliged him to keep himself bent forwards. Vomiting and hiccup supervened, on the appearance of which symptoms he was conveyed to this hospital. The usual assistance of art having failed in effecting the replacement of the hernia, M. Volpi, first surgeon of the hospital, proceeded to the operation. On laying open the hernial sac, he found a portion of omentum about four inches long, which from being blackish, he cut away close to the inguinal ring. Having divided the inguinal ring along with the hernial sac, he easily returned the intestine, and so completely as to be able to move his finger freely in the cavity of the abdomen. Twenty four hours after the operation, the patient had an abundant discharge of soft feces, and the three following days every thing went on well. On the fourth day the stools were scanty and black, and the abdomen became swelled and pain-

ful to the touch. On renewing the dressings, a portion of the intestine, which had been returned with so much facility, was found protruded out * of the abdomen; this fold, on being gently pushed, retired into the abdomen with the same facility as before; notwithstanding, the pains of the abdomen, the dragging at the stomach, the vomiting and hiccup, increased greatly; by the violence of which symptoms the patient was carried off. On opening the abdomen (*b*), the small intestines appeared enormously distended and inflamed. The *transverse* colon and the stomach were drawn very low † down. But the most singular circumstance was, that the omentum in the cavity of the abdomen was divided into two portions, of which the anterior ‡ and larger portion (*c*) was of a triangular shape, its apex descended into the right groin, and from thence extended into the hernia, while the other smaller portion of omentum (*d*) passed deeply behind § a fold of the mesentery, which supported several convolutions of the ileum. The anterior ‖ larger portion of the omentum, at its entrance into the hernia, gave off a band (*e*) about four lines in breadth, and two in thickness, apparently fibrous, which was bent backwards behind ¶ the convolu-

(*b*) Pl. IX. (*c*) Ibid. b. (*d*) Ibid. c. (*e*) Ibid. d. e. e.

* Peripherad. † Much sacrad. ‡ Sternal. § Dorsad of.

‖ Sternal. ¶ Dorsad of.

tions of the ileum, and from thence ascended to join the posterior * smaller portion of omentum concealed behind † a fold of the mesentery. The noose formed by this union of the two portions of omentum, included a very considerable portion of ileum *(f)*, and at the upper ‡ part of the hernia, likewise constricted the intestine (*g*) by compressing it against the attachment of the mesentery. Under § this noose hung the loop of intestine (*h*) which had formed the hernia, and this loop, although it had been twice easily reduced, was found lying in the groin without ‖ the abdomen. This loop also showed marks (*i*) of having been likewise strangulated by the neck of the hernial sac. The place was also very evident, where, in the act of operating, the part of the omentum in the hernia had been cut away (*k*) close to the inguinal ring, of which a small process (*l*) still remained within the cavity of the abdomen. On laying open the intestine immediately above ¶ the nooze formed by the two portions of omentum (*m*), a large dose of quicksilver, which the patient had been made to swal-

* Dorsal. † Dorsad of. ‡ Atlantal.
§ Sacrad of. ‖ Peripherad of. ¶ Atlantad of.

(*f*) Plate IX. n. o. p. q. (*g*) Ibid. e. d. (*h*) Ibid. g. g. h. h.
(*i*) Ibid. i. i. (*k*) Ibid. d. e. e. (*l*) Ibid. f.
(*m*) Ibid. d. o.

low, in order to promote the natural course of the feces, was found collected at that place with a great quantity of feculent matter.

§ 19. It is not easy to determine, whether this fissure of the body of the omentum in the cavity of the abdomen had been a *congenital* defect, or had been produced by a laceration occasioned by a violent impulse of the intestines against the omentum. The account which I have been able to collect from the parents of the deceased, is, that this man, when a boy about five years of age, was taken by a woman under the axillæ, and that she had turned him back awkwardly over her shoulder, making his back describe a concave arch, and the belly a convex; at which moment the child complained of great pain over the whole abdomen, and at that time the hernia just described was formed in his right groin, with symptoms of incarceration, which were relieved by the application of topical emollients. This circumstance renders it probable, that in this patient the fissure of the omentum within the abdomen, is to be ascribed entirely or in a great measure to the violence which he had suffered. The point, on which there can exist no doubt, with regard to the immediate cause of the last strangulation, is, that it was not the neck of the hernial sac, but the noose formed by the anterior and posterior * por-

* Sternal and dorsal.

tions of the omentum which occasioned the loss of this man; since, in the act of operating, the neck of the hernial sac had been completely divided, together with the inguinal ring, and the intestine had been easily returned into the abdomen, so that the operator was enabled to introduce his finger into it, and move it freely in all directions. Although this case may seem very formidable, it ought not however to be considered as beyond the reach of the hand of the surgeon. Because it is a circumstance deserving the most attentive reflection in this case, that the noose formed by the omentum during the time that the hernia was seated in the groin, or before the return of the intestine, was not, properly speaking, in * the cavity of the abdomen, but without† the margin of the inguinal ring; this fact is evidently proved by the excision of the omentum performed in the hernia close to the inguinal ring (*n*), having very nearly included the noose formed by the two portions of omentum. And this same circumstance was evident in the dead body before dissection, for, on introducing the finger along the loop of intestine descended again into the groin, the noose formed on the intestine by the omentum was distinctly felt a little beyond ‡ the margin of the ring, between which noose and the intestine, it would not have been difficult to pass a fine

* Centrad of. † Peripherad of. ‡ Atlantad of.

(*n*) Pl. IX. f. e. e. d.

grooved probe, and upon it a probe-pointed bistoury. It must however be allowed, that this species of strangulation formed by the omentum, is one of the most likely to lead to error. For in the other species above described, on dividing the neck of the hernial sac and inguinal ring, if the intestine does not re-ascend, the cause is evident, in the adhesion of the omentum to the hernial sac, and in the manner in which the omentum surrounds and constricts the intestine; but in the case just related, after the incision of the ring and of the neck of the sac, the intestine returned easily, and without showing the smallest sign of concealed complication, and it was only the continuance of the symptoms which led to the suspicion of internal strangulation. At any rate, it appears to me that this fact ought to remind surgeons of the observation of the general precept, whenever, after the intestine has been easily returned, the symptoms of incarceration do not in consequence cease, but rather increase, to make the patient stand on his feet, to make him cough, to press on the abdomen, in a word, to employ every method to make the intestine reappear in the groin; then, drawing it gently downwards*, and examining along it the seat of the strangu-

* Sacrad

lation, which will not be far from the margin of the inguinal ring, to divide it completely on the finger or grooved probe; on which point read the interesting and useful observations of Lapeyronnie (*o*) and Renoult (*p*).

§ 20. With regard to the internal constrictions producing *volvulus* without hernia (*q*), these do not enter into the plan which I proposed to follow in this memoir. Besides, these severe and fatal accidents do not present certain and positive marks of the situation and manner of the strangulation, if we were even to suppose it posssible to derive any effectual advantage from surgery. I shall mention however what I have had an opportunity of observing with regard to one species of these strangulations of the intestinal canal formed by the *appendix vermiformis*.

A postilion, twenty four years of age, after having been attacked at intervals during the course of eight years with several dangerous intestinal colics, which were ascribed to a violent blow he

(*o*) Acad. R. de chirurg. Tom. III. pag. 327.

(*p*) Journal de Méd. de Paris, T. xvii. pag. 24.

(*q*) Durignau, Acad. R. de chirurg. T. xi. pag. 333. Lafaye, *ibid.* p. 374. Moscati, *ibid.* T. ix. pag. 103. Maille, Saucerrotte, *ibid.* T. xi. pag. 375. Malacarne delle osserv. in chirurg. T. ii. pag. 226.

had received on the abdomen, died during an attack of pain in his bowels, accompanied with all the symptoms of incarcerated hernia. On dissection I found that the *appendix vermiformis* surrounded in the manner of a ring, and strangulated a long loop of the ileum just before its insertion into the colon. The natural and usual length of the *appendix vermiformis* would not have been sufficient of itself alone to complete the noose, but there was added to it a strip of substance similar to that of the mesentery, which went off from the point of the *appendix vermiformis*, and was inserted posteriorly* into the cæcum. At first sight, it would have been said that the ileum had perforated the small mesentery which unites the *appendix vermiformis* to the cæcum. The internal surface† of the belt was hard and callous. The *appendix vermiformis* was only pervious for a few lines in the vicinity of its opening into the cæcum. The loop of the ileum which passed through the belt, was fully two hand breadths in length, inflamed, and even gangrenous at some points. It appears to me very probable, that at the period of the preceding attacks of colic, only a small loop of intestine had passed through the narrow opening, which intestine spontaneously, or by means of the action of

* Dorsad. † Central aspect.

the baths, fomentations, glysters, cupping glasses, applied to the pained part, had retired sufficiently from the noose to allow a free passage to the feces; but at the last time, preceded perhaps by some violent exertion, or by irregularity of diet, a larger loop of intestine having passed through the belt, the strangulation had of necessity become permanent and consequently fatal. The pathological preparation of these parts is preserved in this museum. The great similarity of this case with that observed by Lafaye (*r*), leaves no doubt that these unfortunate symptoms gradually return in the same order, and in consequence of determinate causes, which we are unfortunately unacquainted with.

§ 21. Before surgeons had clear and accurate ideas of *congenital* scrotal hernia, as they very frequently saw the viscera denuded and in immediate contact with the testicle, they were of opinion that a very frequent case of strangulation of the viscera was occasioned or preceded by rupture of the hernial sac, and by the passage of the viscera into the vaginal coat of the testicle. This complication is at present, and not without good reason, considered as a very rare occurrence (*s*). I have not

(*r*) Acad. R. de chirurg. T. ix. pag. 374.

(*s*) Mr. Astley Cooper mentions, that he attended a case of inguinal hernia in which the sac had been burst by a blow;

met with a single example in my own practice, nor in the dead bodies of the many patients affected with hernia which I have examined. I am only acquainted with two well authenticated examples of rupture of the hernial sac in *common* scrotal hernia, the one published a long time ago by Petit (*t*), the other recently by Remond (*u*). In the first case, of a man, it is mentioned, that the patient received a kick from a horse in the scrotum, which caused a rupture of the hernial sac at its upper part*, by which the intestines passed out freely and formed a second hernia on the same side, which extended to the middle of the thigh. The second, is the case of an hospital attendant, about sixty years of age, who had had an inguinal hernia on the right side from his infancy. For a long time the patient had observed, that on pressure the hernia ascended, advancing above† the inguinal ring, so that in the latter days of his life he was obliged to depress the tumor from above

" the viscera had escaped under the skin of the scrotum, " through a hole in the fore part of the sac, and were obliged " to be returned into the sac before the reduction of the hernia " could be effected." Anatomy, &c. of Inguinal Hernia, p. 3. *T.*

(*t*) See Garengeot, oper. chirurg. T. i. chap. v. obs. xvi.

(*u*) Journal de méd. chirurg. par. Corvisart, &c. Vol. xv. Avril 1808.

* Atlantal extremity. † Atlantad of.

downwards*, and then to direct the viscera from without† towards the seat of the inguinal ring. During a violent effort the hernia became incarcerated, and formed an unusual tumor extending from the ring towards the umbilicus, within which tumor the intestines were felt by the touch only covered by the skin. The operation was had recourse to. On laying open the hernial sac, and afterwards that portion of the tumor which extended towards the umbilicus, the intestine was laid bare for the space of fifteen inches. A small portion of intestine was found in the scrotum, and, properly speaking, within the hernial sac. It was then clearly perceived that the principal mass of the intestines, which formed the greater bulk of the hernia, from the ring towards the umbilicus, had made its way through between the integuments and the aponeurosis of the *external* oblique muscle, after having lacerated the hernial sac at its upper‡ part. After dividing the inguinal ring, the whole protruded portion of the intestine was completely returned into the abdomen. The patient did not survive the operation. On dissection, the truth of what had been remarked during the operation of the hernia, was completely proved, viz. that the hernial sac had been lacerated at the up-

* In a direction from the atlantal to the sacral aspect.

† The peripheral aspect. ‡ Atlantal extremity.

per part towards its outer side*. This case teaches us, that it is not in the option of the surgeon, in similar cases, to commence the incision of the hernia on the one or other of the tumors proceeding from the rupture of the hernial sac, but that in the first place he ought to open the hernial sac in the scrotum, where the sac is sound and uninjured, and then proceed to the place of the rupture, if he wishes to succeed in laying bare the viscera with expedition and safety, which have insinuated themselves between the integuments and the subjacent parts.

§ 22. Richter is of opinion (*x*), that a species of strangulation sometimes takes place in hernial patients, which he calls *spasmodic*; the immediate cause of this strangulation he conceives ought to be ascribed to the spasmodic contraction of the *external* oblique muscle of the abdomen, and consequently of the inguinal ring. *The inguinal ring*, says he, *is indeed tendinous and cannot contract; but its tendinous fibres are continuations of the muscular fibres, and when the latter contract, their action necessarily extends to the tendinous fibres forming the ring. If from any cause the fleshy fibres of the great oblique muscle are spasmodically shortened, the ring must of necessity be contracted.* This opinion does not

* Towards the atlantal and lateral aspect.

(*x*) Traité des hernies. chap. xii.

appear to me to pass beyond the limits of an hypothesis. The inguinal ring is only the separation of the two aponeurotic bands of the *external* oblique which are inserted into the upper* part of the pubes. And since, as Richter says, these bands are arranged in the same direction with the fleshy fibres of the *external* oblique, the force of this muscle, both in the healthy state and in the state of spasm, will be invariably directed against the os pubis, never against the margins of the ring. If the action of this muscle in a state of spasm was able to constrict the ring, the same effect would be produced, although with less force, by the regular and alternate contraction of this muscle, which is false. The inferior vena cava passes through the aponeurosis of the diaphragm, and yet this vein is never strangulated during the violent contractions and most obstinate spasms of this muscle; the femoral artery passes through the large portion of the tendon of the great adductor of the thigh, and during the strongest spasms of this muscle, no one has ever remarked that the femoral artery was strongly compressed. A violent spasm of the abdominal muscles may indeed make the viscera descend into a hernia, with so much force as to make it impossible for the patient lying in bed to retain them, as has been observed

* Atlantal.

by Latta (*y*), but that is very different from constricting the inguinal ring.

The cases of strangulation, which Richter calls *spasmodic*, are those, if I am not very much mistaken, in which the hernia is complicated with general spasm of the intestinal canal, which spasm has sometimes the characters of colic, properly called *spasmodic*, sometimes *flatulent*, sometimes *bilious*, *stercoraceous*, *verminous*, and the like. Whenever a hernial patient is attacked by one of these colics, the loop of intestine which is in the hernia, on account of its continuity, necessarily participates in the state of irritation and spasm, with which the whole intestinal canal contained in the abdomen is affected. In the same manner, the alleviation of the symptoms depending upon the affection of the whole intestinal tube, corresponds with the abatement of the symptoms of irritation, and of spasm of the loop of intestine contained in the hernia. In the *flatulent spasmodic* colic of hypochondriacs and of hysterical women, every one knows how great a quantity of gas is disengaged in the stomach and bowels of such patients, and if they are at the same time subject to hernia, it will necessarily happen, that, as all the intestinal canal is affected, that portion of the canal contained in the hernia will partake of the state of dilatation and

(*y*) Practical system of surgery, T. i. p. 118.

of spasm alternately, by which the whole tube of the intestines is affected. In the abdomen of these patients at different places, through the whole length of the intestinal canal, spasmodic strictures are formed,and incarcerations of flatus, which can neither ascend nor descend during the paroxysm; if this accidentally happens, as it may readily do, in the abdomen in the vicinity of the hernia, there must of necessity take place in the hernia itself, a sudden painful flatulent distension, not unlike strangulation of the intestine. The moment the paroxysm is finished, the patients discharge a great quantity of air by the mouth and by stool, and the symptoms of tension of the abdomen, and of strangulation of the hernia, disappear in proportion as the spasmodic flatulent distension abates, by which the whole intestinal canal was affected. Nearly the same symptoms occur in hernial patients attacked by *bilious*, *stercoraceous*, or *verminous* colic, or by that occasioned by the suppression of perspiration. It is observable, with regard to these diseases, that in the *bilious* and *stercoraceous* colics, the patients only vomit, in most cases, the substances nauseous to them at the time, such as soup, the yolk of an egg, and the like, while they retain water and other liquors in abundance; farther, the hernia, in these circumstances, although very tense, is susceptible of being diminished in bulk without great

inconvenience to the patients, in whom it not unfrequently returns completely, although there be no abatement of the symptoms of irritation and tension of the whole intestinal canal from accumulation of bile, of feces, or of worms. Farther, if with regard to this subject we consult practical observations, it will be found, that in the *flatulent spasmodic* colic, ipecacuan in small and repeated doses, carminative glysters, fomentations, general tepid baths, blisters over the abdomen, as remedies proper for abating the tension of the abdomen, and of the whole intestinal canal, produce the same good effect also in hernia. In the same manner, in the other species of intestinal colic, it happens in practice, that during the use of mild laxatives, of anthelmintics, and especially of frequent glysters, sometimes even of emetics given in proper cases, we observe an abatement of the symptoms, I do not say of incarceration, since they never amount to that degree, but of troublesome and painful tension in the hernia, which symptoms are not peculiar to the protruded viscera, but in common with the affection of the intestinal tube contained in the abdomen. These facts are not less true, although the explanation of them given by Richter is not in my opinion satisfactory (*z*). This celebrated author, on the contrary, deserves praise

(*z*) Mr. Astley Cooper is of opinion, that the *spasmodic* nature of the stricture, may be explained by the strangulating

for having fixed the attention of surgeons on this important point of practice, that is, that symptoms of strangulation in hernia sometimes appear, the principal cause of which is not properly in the hernia, but in the intestinal tube contained in the abdomen, to alleviate which symptoms little or no benefit is derived from the usual topical applications, when they are not conjoined with internal remedies directed to remove or diminish the affection of the whole intestinal canal, whether it be *spasmodic*, *flatulent*, *saburral*, or *verminous*.

Properly speaking, neither spasm, in the sense explained in this paragraph, nor the gradual contraction of the neck of the hernial sac, nor the stricture formed by the omentum, or by any other kind of bridle around the intestine, are ever the *efficient* cause of incarceration in hernia, but merely the *predisposing* cause. In fact, the *efficient* cause, in every case, is the increase of size of the protruded intestine by the sudden descent of another portion of intestine, or by the excessive distention produced in the protruded loop

pressure being made by the transversalis muscle and its tendon. A portion of intestine protruding under the edge of the internal oblique and transversalis muscles, compresses them, and these muscles being stimulated to contract by the irritation of this pressure, re-act upon the intestine with a force capable of producing strangulation, accompanied with spasmodic symptoms. *Anatomy, &c. of Inguinal Hernia, p.* 21.—T.

by flatus or feculent matters. The loop of intestine, much distended, forms on both sides of the neck of the sac and of the ring an acute angle, sometimes very acute, with the portion of the intestine contained in the abdomen, in the acuteness of which angle consists, properly speaking, the *efficient* cause of the incarceration. Whoever has once examined, in operating on an incarcerated hernia, the acuteness of this angle, and the degree of force which is required for removing it, will distinctly perceive how much those surgeons are mistaken who flatter themselves with being able to disengage the intestine from its confinement, by increasing the action of the corresponding portion of the intestine within the abdomen. The operation of the taxis even cannot succeed, if in the first place the surgeon is unable to effect the return of as much of the air and feculent matter into the abdomen through that angular passage, that, at least the acuteness of the angle being diminished, the protruded portion of intestine may be nearly in the same direction with that which is compressed by the neck of the hernial sac.

§ 23. I have hitherto treated of the principal causes and different species of strangulation of the viscera in hernia, as well as of the means which experience has shown to be the most speedy

and effectual for overcoming these obstacles to the replacement of the protruded parts. I now proceed to examine another kind of complication of this disease, which arises from the adhesion of the viscera to each other, or to the hernial sac. In general, observation and experience have supplied us with marks from which we may be led to suppose, that a hernia is complicated with adhesion; but in reality we have no certain mark, from which, before laying bare the viscera, we can determine with precision and certainty what kind of adhesion we have to treat, and between what parts and to what degree, it has taken place. In general, in hernia, we may enumerate three distinct species of adhesion of the viscera between each other and with the hernial sac, the *gelatinous*, the *filamentous* or *membranous*, and the *fleshy*.

§ 24. The *gelatinous* adhesion, a very general consequence of the *adhesive* inflammation which attacks membranous parts placed in mutual contact, is only formed by a certain quantity of coagulable lymph, effused from the surface of the inflamed parts, which, coagulating, assumes sometimes the appearance of a vesicular reddish substance, stained with blood (*a*), sometimes of threads

(*a*) Morgagni de sed. et caus. morb. Epist. 34. art. 9. Ad sacculum autem quidquid omenti in eo erat annexum

or whitish membranes, easily separable from the parts between which they are interposed and which they unite together, without any abrasion or laceration being produced by the separation, on the surface of the parts agglutinated together. Examples of this kind are frequently met with in herniæ which are operated on, and still more frequenty in the bodies of those who die of inflammation of the viscera of the chest or abdomen, particularly at the points of contact of these viscera with each other, or with the pleura or peritoneum.

§ 25. The *filamentous* or *membranous* adhesion is formed by an indefinite number of filaments, bridles, or layers truly membranous and organised, which constitute so many points of union of the viscera to each other, or to the hernial sac, arranged at various distances. For, many varieties are observed with regard to the length, the number, the figure and consistence of these membranes. There sometimes occurs only one, sometimes more, even as many as eight or ten; they are sometimes arranged in a continued series, and represent, properly speaking, a transparent membrane (*b*); they are sometimes drawn from

passim inveni per interjectum quoddam corpus rubens et flaccidum, ut facile posset ab omento et sacculo separari, nec aliud quam membranaceæ cellulæ viderentur.

(*b*) Pl. VIII. fig. 2. d. d. e. e.

the intestine to the hernial sac, sometimes from the intestine to the omentum, as so many rays from a centre to the circumference; sometimes they are filiform, sometimes flat; lastly, they are sometimes friable on merely being touched with a finger or spatula; sometimes they are consistent and almost tendinous. The *filamentous* or *membranous* adhesion differs essentially from the *gelatinous*, as has been said, in so far as the *gelatinous* is only condensed mucus, while the *filamentous* or *membranous* is formed by a substance actually organised; in a word, by the same thin covering or membrane supplied by the peritoneum which covers externally* the intestine and the omentum; which circumstance I have been able to see distinctly, and to prove repeatedly, with the naked eye, and with the assistance of a glass. For, on dividing with the hand unsupported these filaments and membranes, and turning them carefully back on the one side over the intestine, and on the other over the hernial sac, I have distinctly observed that these very fine transparent pellicles were a continuation of the fine external† tunic of the intestine or of the omentum, under ‡ which membrane, as between two leaves of a book, was situated a very delicate cellular substance; and farther, the intestine

* Peripherad. † Peripheral. ‡ Centrad of.

or omentum at the place corresponding to where these membranes were inserted into it, was deprived of the shining thin covering which they receive from the peritoneum. On which account, I am of opinion, that the formation of this *filamentous* or *membranous* adhesion is constantly preceded by a slight attack of adhesive inflammation with immediate union of the intestine, or of the omentum with the hernial sac; a superficial union indeed, but, in progress of time, especially from the intestine separating gradually from the hernial sac by its own vermicular action, by the considerable distention produced in it by the interruption to the feces, by its proper contractile power and that of the mesentery, by the interposition of serum always collecting in the sac, the thin covering of the intestine, corresponding to the points of superficial adhesion with the hernial sac, yields and elongates so as to form at last one or more filaments, bridles, or membranes interposed between the intestine and the sac of the hernia. This accounts for these filaments or bridles being really organised and provided with small blood vessels, without any necessity for having recourse, for the explanation of this phenomenon, to Hunter's hypothesis of the conversion of coagulable lymph into a vascular and organised substance. In *congenital* hernia, we not unfrequently find these bridles uniting the intestine or omentum to the

testicle, although there never has been any certain mark of preceding *adhesive* inflammation. The difference, compared with *common* hernia, consists in this, that the membranous bridles and laminæ in *congenital* hernia existed in the abdomen prior to the descent of the testicle, and they contribute very much to cause a portion of the intestine or omentum to descend along with the testicle.

§ 26. These two species of adhesion of the viscera to each other, or to the hernial sac, never oppose any considerable hindrance to the completion and success of the operation for incarcerated hernia; for, if it be a case of *glutinous* adhesion or from concreted mucus, it is easily separated by passing the point of the finger, or of a spatula, between the parts agglutinated together, without the surface of the viscera to be returned remaining bloody or being injured in any way: at the most, it merely presents the appearance of a surface slightly villous at the place of the union. If the adhesion is formed by bridles, filaments, or organised membranes, they may be easily and safely divided with a pair of scissars, or by passing the edge of the knife lightly over them, while with the other hand the viscera are kept separated from each other, or from the hernial sac (*c*).

(*c*) Pl. VIII. fig. 2. d. d. e. e.

At these points of attachment of the bridles, it is true, the intestine or omentum is deprived of its fine external * covering; but nevertheless, experience has shown, that after the viscera are returned into the abdomen, this does not produce symptoms of any consequence, and does not retard the cure.

§ 27. The adhesion of the viscera to each other, or to the hernial sac, commonly called *fleshy* by surgeons, according to my observations is of two kinds, the one *unnatural*, the other *natural*. The *unnatural fleshy adhesion*, if we consider only the immediate cause from which it is derived, does not differ at all from the *filamentous* or *membranous*; since both are produced by the *adhesive* inflammation. If however we consider the depth and strength of the adhesion, they differ very much from each other. For in the *filamentous* and *membranous*, there is only a superficial coalescence of the intestine or omentum with each other, or with the hernial sac, and the union only affects, properly speaking, the thin external † membranous covering of these viscera; which layer, as has been said, from its thinness and ductility, allows itself to be elongated and drawn out in the form of filaments, bands, and transparent mem-

* Peripheral. † Peripheral.

branes; while, on the contrary, in the *unnatural fleshy* adhesion, the cohesion takes place deep in the substance of the parts which are in close contact, and so strongly, that no separating force of those just mentioned, is capable of relaxing these points of union, and of forming them, as in the first case, into so many filaments, bridles, or membranes. This species of *fleshy* adhesion takes place more frequently between the omentum and the hernial sac, than between the omentum and the intestine, or between the intestine and the sac. I have delineated one of these *fleshy* adhesions of the omentum with the hernial sac (*d*), which was so strong, that it would have been impossible to separate it without cutting through the omentum, and leaving a portion of this viscus adhering to the sac of the hernia. The same kind of cohesion, although more rarely, forms between the intestine and the hernial sac, with this difference, however, that that of the intestine is most frequently met with in the vicinity of the neck of the sac, while that of the omentum in general takes place with the sides and bottom of the sac. This close and deep species of cohesion of the viscera with the hernial sac, is not unlike the cicatrix resulting from the union of the lips of a simple wound; as in both cases, there is a con-

(*d*) Plate VIII. fig. 3. f. f.

tinuity and intimate union of substance with thickening of the parts at the place of their union, at which place, the vascular system of the one communicates with that of the other, so that both parts enjoy a common vitality. And it ought not to excite surprise, that so intimate and close a connection takes place between soft parts very vascular and endued with great vitality, since we observe the same phenomenon take place with regard to harder and more inert parts of our body, as in the bones, in a case of *anchylosis*, in consequence of which their articular heads form a mutual union so strong as to be incapable of being separated, where the vascular system of the one evidently communicates with the vascular system of the other.

§ 28. When, in the act of finishing the operation of the incarcerated scrotal hernia, we meet with the *unnatural fleshy* adhesion of the omentum to the hernial sac, to the intestine or testicle, the surgeon cannot feel any perplexity with regard to the plan which he ought to adopt with respect to the omentum; in every case of this kind, he should divide the omentum in the vicinity of its adhesion with the one or other of the above mentioned parts, and do it without delay, if the adhesion of the omentum constitutes the principal

obstacle to the replacement of the viscera. Pott (*e*) met with a case of hernia, in which the omentum had formed close adhesions with the hernial sac, and with the testicle, in ten different places; notwithstanding he divided them all; and as the omentum was in other respects sound, he returned it into the abdomen with complete success. This operation is not equally expeditious and safe in a case of *fleshy* adhesion, in the manner of a cicatrix between the intestine and the hernial sac; or rather of all the accidents of this kind, this is one of the most dangerous for the patient, and which requires the greatest intelligence and circumspection on the part of the surgeon; with regard to which circumstance, no rule sufficiently clear and precise has been hitherto given to direct young surgeons, although, in my opinion, this point is one of the most important of the operation for hernia. From repeated observations on the living and on the dead subject, it appears to me, as I have mentioned above, that in most cases, this close adhesion of the intestine with the hernial sac, takes place with the neck of the sac, or at a little distance below * the inguinal ring. In similar circumstances, after removing the immediate cause of the strangulation existing in the

(*e*) Chirurgical Works, T. III. p. 299.

* Peripherad of.

neck of the hernial sac, or in the inguinal ring, or in both of these parts, the surgeon, in my opinion, would commit a very great error if he were to attempt to separate by means of the knife, and free the intestine from the *fleshy* adhesion with the hernial sac, especially if this adhesion were very extensive. Because, in the first place, he would have no certain guide for conducting the knife through the extensive cicatrix, and he would run the risk of wounding the intestine, or of dividing with a portion of the hernial sac the spermatic cord, situated immediately behind* the neck of the sac; in the second place, because the extensive bleeding wound inflicted on the detached intestine replaced in the abdomen, could not fail to occasion consecutive symptoms, very much to be dreaded on account of the effusion of blood, the inflammation, the suppuration and rupture of the intestine in a point perhaps not sufficiently corresponding with the external wound. On which account, having considered all these dangers, and compared them with the advantages which experience has showed to be derived from a practice quite opposite to this, I am of opinion, that the best curative indication, to be followed in similar causes, after having completely removed the immediate cause of the strangulation, is to leave

* Dorsad of.

the intestine adhering to the sac as it is found, and to rest satisfied with covering it with the sides of the hernial sac, and with cloths dipped in a tepid decoction of marsh mallows. It is a very remarkable fact in practical surgery, that in these cases, after the removal of the immediate cause of the strangulation, although the fold of intestine remain on the out side* of the ring, the feces resume their natural course, and consequently all the pain, vomiting, and hiccup quickly cease. On the following days, during which the surgeon will continue to moisten the dressings day and night with the decoction of mallows, the adherent portion of the intestine with the sac is observed to ascend spontaneously upwards† towards the ring, and in process of time it retires entirely, or in a great measure beyond‡ the ring. Finally, that portion of intestine, which cannot be drawn back into the abdomen by the powers of nature, exfoliates, as surgeons term it, becomes reddish and granulous, and is at last inclosed in and covered by the common integuments of the groin and scrotum.

A monk, about fifty years of age, had had from his youth a scrotal hernia of the left side, which he had never attended to keep reduced by a proper bandage, although latterly he had been trou-

* Peripherad. † Atlantad. ‡ Atlantad of.

bled with almost habitual colics. During a violent effort to raise a weight, the hernia became incarcerated, with an evident increase of size. The severity of the symptoms determined me to proceed instantly to the operation. Having removed the strangulation by means of an incision of the neck of the hernial sac, and of the inguinal ring, I had no difficulty in returning that portion of the intestinal canal which had recently descended into the hernia, but when I came to reduce the rest of it, I found that the intestine was so firmly adherent to the posterior * part of the sac about an inch below † the inguinal ring, that it would have been impossible for me to detach it from it without making an extensive and dangerous incision. I therefore contented myself with covering the portion of intestine remaining externally ‡ with the sides of the hernial sac, and with pledgits moistened with tepid water, directing an assistant to prepare a decoction of mallows, and to moisten the dressings frequently with it both day and night. Immediately after the operation, the symptoms of incarceration ceased, as the neck of the sac and the ring had been completely divided, and a few hours after, the patient had abundant evacuations of his bowels, which were encouraged by repeated glysters. On the

* Dorsal. † Peripherad of. ‡ Peripherad.

sixth day after the operation, the wound being evidently suppurating, I cautiously removed the dressings, and clearly perceived that the intestine had approached a little upwards* towards the inguinal ring. The dressings were continued in the same way. In three days more, the portion of intestine which remained still externally† appeared slightly red and granulous. On the thirteenth day, the intestine was completely concealed behind‡ the inguinal ring. In other three weeks the cure was completed, without any remains or appearance of tumor.

Richter has published a fact similar to this (*f*). "Frederic Schomann came to the hospital with "an inguinal hernia, on the 4th Semptember 1794. "The hernia had been incarcerated for four days, "and the patient had had it for ten years. The "symptoms of strangulation were not so violent "as to preclude the use of the ordinary remedies, "which having however proved ineffectual, I pro-"ceeded to the operation on the following day. "The hernia consisted of omentum and intestine. "Although the intestine was of a dark red colour, "I nevertheless returned it. When in the act of "completing the reduction, I perceived that a "part of the intestine was firmly adherent for the

* Atlantad. † Peripherad. ‡ Centrad of.

(*f*) Loder's Journal, B. I. p. 19.

" space of two inches to the posterior* part of the " hernial sac, and to its neck. I separated the " portion of intestine which was at the lower† " part, the adhesion of which was of a triangular " shape, and I left untouched the remaining ad- " herent part, towards the inguinal ring. By " means of a glyster given in the evening, the " patient had two evacuations. On the following " morning, the patient complained of violent pains " of the abdomen. He was bled copiously, and " the abdomen was rubbed with oil of chamomile. " On the eighth day, the pains of the abdomen " being still intense, I ordered him to be bled " again. The patient felt some pain also in the " seat of the hernia. On the ninth day the pain " had abated, the pulse was calm and soft, and " the alvine evacuations natural. On removing " the dressings, it was impossible to judge of the " state of the wound, as some pledgits of oint- " ment still adhered to it. On the tenth there " was no pain, and the patient felt himself in " every respect wonderfully well. On renewing " the dressings, it was observed that the portion " of intestine adhering to the superior and poste- " rior‡ part of the hernial sac, had in a great mea- " sure spontaneously risen up§ and retired be-

* Dorsal.
† Sacral aspect.
‡ Atlantal and dorsal.
§ Atlantad.

" yond* the inguinal ring, and only about an inch " of it was seen externally†. On the 25th Sep- " tember it was impossible to perceive the smal- " lest portion of intestine in the bottom of the " wound, which looked well. At this period the " patient was free from every inconvenience." I shall relate in the sequel, other facts similar to this, as a farther proof of the utility of this practice, compared with the dangers resulting from detaching the intestine with the knife from its *fleshy* union with the hernial sac.

§ 29. The other species of close and extensive connection of the intestine to the hernial sac, or the *natural fleshy* adhesion, is that formed by the natural ligaments connecting the intestine, before its descent into the groin, with the great sac of the peritoneum in the cavity of the abdomen. These natural ligaments slide, to use the expression, along with the intestine from the cavity of the abdomen through the inguinal ring into the scrotum. This species of adhesion is not common to all intestinal scrotal herniæ, but is proper and peculiar only to that scrotal hernia which is formed by the descent of the large intestine, that is on the right side by the *cæcum*, with the appendix vermiformis and the beginning of the colon, and

* Centrad of. † Peripherad.

on the left side, by that portion of the colon which in the natural state is connected to the great sac of the peritoneum in the left ileo-lumbar region, a little before this intestine enters the pelvis and assumes the name of rectum. And however close and firm the attachment may seem, which the cæcum and the beginning of the colon have with the great sac of the peritoneum in the right ileo-lumbar region, by means of the two folds of peritoneum, one of which folds forms a fixed point to the os ilium, the other to the external* margin of the psoas muscle, yet it is not an uncommon case, that the cæcum, with the appendix vermiformis and the extremity of the ileum, descend through the inguinal ring to the bottom of the scrotum (*g*), along with that portion of the great sac of the peritoneum, to which the intestines just mentioned are naturally connected in the cavity of the abdomen (*h*).

§ 30. In dissecting several of these herniæ, I have found, that the cæcum, with the appendix

* Lateral.

(*g*) Pott, Chirurg. Works, T. II. p. 61. I have already mentioned it as my opinion, that ruptures are sometimes rendered difficult to be reduced by that portion of the intestinal canal, which is called the cæcum, or the beginning of the colon being contained in the hernial sac.

(*h*) Pl. VII. fig. 1, 2.

vermiformis, and the beginning of the colon descending through the inguinal ring into the scrotum, not only relax the natural bridles which connect these intestines to the os ilium, and to the psoas muscle, but likewise that these intestines, in descending, draw after them into the scrotum that part of the great sac of the peritoneum, to which they are naturally united opposite to the right side. Consequently the hernial sac, within which these intestines are contained in the scrotum, is formed by the same identical portion of the great sac of the peritoneum, which in the sound state lined the right ileo-lumbar region, and formed the duplicatures and ligaments connecting the cæcum with the appendix vermiformis, and the beginning of the colon to the right os ilium and to the psoas muscle; from whence it happens, that on opening the hernia, these intestines are found adhering to the hernial sac in the same manner as they were united to the great sac of the peritoneum within the abdomen in the right ileo-lumbar region. And it is precisely on this account, that I call this species of adhesion of the viscera to the hernial sac *natural fleshy*, because it is formed by the same *natural* connections which the cæcum and the appendix vermiformis have, in common, in the abdomen with the great sac of the peritoneum. However strange, and perhaps incredible, this phenomenon

may seem to beginners in surgery, it will not surpass the belief of those who are acquainted with the great extensibility of the peritoneum, and of the cellular substance which unites it loosely to the muscular parietes of the abdomen (*i*), and who are not ignorant, that there are similar facts well authenticated, even more wonderful than this, of which I have already made mention in the preceding Memoir, viz. of viscera firmly connected to the great sac of the peritoneum, which have been found in the dead body at a considerable distance from their natural situation, and removed to that place, together with the part of the great sac of the peritoneum to which they were naturally firmly united.

§ 31. I have had an opportunity of examining, and of following step by step, to use the expression, the formation of this complicated hernia of the groin and of the scrotum. For in the dead body of a man fifty years of age, affected with an inguinal hernia on the right side as large as a hen's egg, I found that the tumor only contained the bottom of the cæcum, and therefore that the points of attachment of this intestine with the

(*i*) Camper *Demonst.* anat. pathol. pag. 18. Id autem circa magnas hernias in universum observavi, quod peritonæum non eousque dilatetur, sed intestina insequatur propter laxitatem cellulosæ membranæ, qua cum vicinis nectitur, præsertim qua parte lumbis nectitur.

great sac of the peritoneum, had only descended about an inch in the vicinity of the inguinal ring from the right ileo-lumbar region. On which account the bottom of the cæcum was quite free and moveable in every direction within the hernial sac, and allowed it to be returned completely without difficulty into the cavity of the abdomen. In the body of another man, the cæcum, with the appendix vermiformis, and the beginning of the colon, had descended lower* into the scrotum than in the subject of the preceding observation. In this case, I found that the† external wall of the neck of the hernial sac, was evidently formed by that portion of the great sac of the peritoneum, which previously lined the right ileo-lumbar region. From the external‡ side of the neck of the hernial sac, were detached membranous folds and bridles (*k*), which were inserted into the cæcum and the beginning of the colon in the same order, and in the same manner as these folds and bridles observe in the cavity of the abdomen, going off from the great sac of the peritoneum to be inserted into these intestines in the right side. The appendix vermiformis (*l*) was in several places in continuity with the hernial sac, viz. in all that space where its small mesentery, formed by the duplicature of the peritoneum, formed part of the

* More sacrad: † Lateral, or dextro-lateral side. ‡ Lateral.

(*k*) Pl. VII. fig. 2. b. c. (*l*) Pl. VII. fig. 2. d. e. f.

hernial sac (*m*). In this subject, on trying to push the cæcum with the beginning of the colon into the abdomen, I did not succeed completely, because, as I have mentioned a little before, the cæcum with its appendix vermiformis was kept there by its *natural* union with the hernial sac, for the space of two inches below* the inguinal ring. In the third case, in the dead body of a man sixty years of age, affected with a large and old scrotal hernia on the right side, I found that the cæcum with the appendix vermiformis, the beginning of the colon and the extremity of the ileum, had descended deep into the bottom of the scrotum (*n*). Nothing could be more evident, than that the natural membranous folds and ligaments of the peritoneum, protruded into the scrotum, to form a part of the hernial sac, were inserted into the cæcum and appendix vermiformis, and acted as a *fleshy* adhesion, and, passing over† these intestines, were clearly converted into their natural shining covering (*o*). That portion of the bottom of the cæcum (*p*), which in the natural state even within the abdomen is moveable and free from attachment to the great sac of the peritoneum, in the hernia likewise allowed itself to be raised and pushed upwards‡ towards the inguinal ring; but

(*m*) Pl. VII. g. h. i. (*n*) Ibid. fig. i.
(*o*) Pl. VII. fig. i. f. b. b. b. a. a. (*p*) Id. b. b. a. a.

* Peripherad of. † Peripherad of. ‡ Atlantad.

the upper* part of that intestine and the beginning of the colon remained so firmly tied to the hernial sac, and for so great a space, that it was impossible to make them return into the abdomen. Farther, the bottom of the cæcum (*q*) was found elongated and enlarged in the lower† part of the scrotum beyond its natural length and size; which must necessarily happen in all large and old herniæ of this species, on account of the accumulation of the feces in the cæcum, the atony of the same intestine, and the debility and insufficiency of the fleshy fibres of the cremaster, to counterbalance the force of the pressure of the abdominal muscles. On opening the abdomen of this patient, the colon of the right side was observed to be drawn downwards‡ towards the groin, and its natural attachment removed from the side to the scrotum.

§ 32. A similar species of *natural fleshy* adhesion of the large intestine to the hernial sac, sometimes takes place also in the left side of the scrotum (*r*), viz. when the hernia is formed by that portion of the left colon, which in the natural state is attached, in the cavity of the abdomen, to the great sac of the peritoneum in the left ileo-lumbar region. The colon, descending into the

* Atlantal. † Sacral extremity. ‡ Sacrad.

(*q*) Pl. VII. fig. 1. a. a. (*r*) Pl. VIII. fig. i.

left epicolic region, is attached on one side to the mesocolon, and on the other to that portion of the great sac of the peritoneum, which lines the left ileo-lumbar region, by means of some broad membranous folds or bridles furnished by the duplicature of the peritoneum, which are discontinued where this intestine passes over* the great iliac vessels, to bend forwards† and descend into the pelvis. Therefore, when the scrotal hernia is formed by the descent of that portion of the left colon situated, in the sound state, above‡ the great iliac vessels, the hernial sac (*s*) is necessarily formed by that part of the peritoneum, which previously covered the left ileo-lumbar region, and descending into the scrotum, draws along with it the folds and membranous ligaments (*t*), which in the natural position of these parts connected the left colon to the ileo-lumbar region of the same side. It therefore happens, that in the left as well as in the right side of the scrotum, on cutting into the hernia, a portion of the colon is found adhering to the hernial sac (*u*) by means of *natural* membranous bands, or by that kind of adhesion which I call *natural fleshy* (*x*).

* Sternad of. † Sternad. ‡ Atlantad of.

(*s*) Pl. VIII. fig. i. e. e. (*t*) Id. c. c. c.

(*u*) Id. a. b. d. c. c. c.

(*x*) Monteggia, Fascicul. patholog. pag. 91—93. This celebrated surgeon has repeatedly observed in the dead sub-

It lately happened, that in a large hernia of this species, besides the above mentioned natural fleshy adhesion of the colon with the hernial sac, I found at the same time a long loop of small intestine, free from any attachment to the sac.

§ 33. From the present state of our knowledge with regard to the proximate and remote causes of hernia in general, it is probable that the descent of the cæcum into the scrotum, sometimes takes place in preference to that of the small intestine, in spite of the strong attachment which the former has in the iliac region. This may arise, in some individuals, from an excessive laxity of the union of the cæcum with the peritoneum, with an extraordinary weakness of the aponeurosis of the *external* oblique of the right side, in consequence of which, from violent and repeated pressure made on all the viscera of the abdomen, the cæcum and the beginning of the colon are more disposed to give place, and proceed downwards * through the groin, than the mesentery and small intestines. It is not improbable, that an habitual excessive accumulation of hard feces in the cæcum, may increase this tendency to displacement. Farther, I am disposed

ject, both of these descents into the scrotum, of the cæcum on the right side, and of the colon on the left side.

* Sacrad.

to believe, that very frequently the hernia of the cæcum, is a consequence of the descent of the extremity of the ileum, in the vicinity of its insertion into the large intestine, which, having passed first into the hernia, afterwards draws along with it the cæcum with its appendix, and the beginning of the colon, with the membranous folds and bands which unite these intestines to the great sac of the peritoneum in the right ileo-lumbar region. And if the hernia formed by the cæcum is *congenital*, there is every reason to believe, that it has been occasioned by the adhesion of the testicle to the cæcum, before the descent of the former into the scrotum. Wrisberg has in fact several times found in the vicinity of the insertion of the spermatic vessels into the right testicle, in tender fetuses (*y*), a species of fibrous

(*y*) Observ. anat. de test. descensu, pag. 52. Aliam in quibusdam cadaveribus observare mihi licuit structuram, quæ intestinorum cum testiculo in scrotum descensum reddere omnino potest facillimum. In aliquot enim fœtuum corpusculis, quorum duo ad hanc usque diem in meis præparatis asservo, in dextro latere vidi strictum quemdam fasciculum in illo loco oriri, ubi vasa spermatica inter peritonæi duplicem laminam testiculum ingrediuntur, adscendendo mox appendici vermiformi, ejusdemque mesenteriolo, mox cæco intestino, mox ilei extremo in colon abeunti insertum deprehendi; tam breves erant hi fasciculi, qui ligamenta esse videbantur, ut vix aliquot lineas superarent; nunquam tam breves in sinistro latere vidi. Ortum omnino capiebant ex peritonæo in duplicaturam mutato, cum interposita stipata quadam cellulosa. Insolita

fascia, or membranous ligament, which kept the testicle partly united to the small mesentery of the appendix vermiformis, partly to the cæcum and to the extremity of the ileum, before the testicle prepared to descend. And on this subject, Sandifort relates the following case (z). "In a "child about three months old, born with a her- "nia in the right side of the scrotum, after the "protruded viscera were supposed to have been "accurately replaced, pressure was applied to the "hernia, which excited all the symptoms of in- "carcerated hernia, from the violence of which "the infant died. On dissecting the body, it was "found that the *congenital* hernia was formed by "the cæcum, with the appendix vermiformis, and "the extremity of the ileum. The appendix "vermiformis was partly adhering to the testicle, "partly to the bottom of the hernial sac, and at "the place of its cohesion to the testicle, it was "become harder and more compact than in the "natural state, an undoubted mark that the ad- "hesion of the appendix vermiformis to the tes- "ticle existed before the birth of the child, and

illorum brevitas suspicionem movebat, periculo non vacare illos embryones futuræ herniæ, quibus talis esset conformatio. Id enim quilibet experiri, ut ego feci, potest, qui tales fœtus videndi opportunitatem habet, prehenso intestino testem cum illo in annulo elevari et attolli, et depresso vicissim testiculo, intestinum simul versus annulum urgeri.

(z) Icones herniæ congenitæ.

" consequently before the descent of the testicle,
" and the formation of the hernia of the cæcum."

§ 34. The scrotal hernia formed by the cæcum with the appendix vermiformis, and the beginning of the colon, being always large, presents appearances in the act of operating which may lead to error, and especially it might be thought, that these intestines were on the outside * of the hernial sac, or unprovided with a membranous sac formed by the descent of the peritoneum. If any one skilled in anatomy will reflect a little on this transposition of parts, and recollect, that the cæcum with the beginning of the colon in the right ileo-lumbar region, is not entirely inclosed within the great sac of the peritoneum, and that a portion of these intestines, sunk in the cellular substance on the right side, is absolutely without † the great abdominal membranous sac, he will immediately discover, that in a scrotal hernia of such a description, a portion of the cæcum and of the beginning of the colon, will be found included and contained in the hernial sac, while another portion of the same intestines will be necessarily without ‡ the sac, and lying denuded in the cellular substance which accompanies the descent of the peritoneum in the hernia. Now, if any one, not sufficiently skilled in anatomy, and unaccus-

* Peripheral aspect. † Peripherad of. ‡ Peripherad of.

tomed to the examination of this disease in the dead body, shall cut into this species of hernia, carrying the incision too much towards the outer side * of the tumor, after opening the sheath of the cremaster, he will meet with the cæcum and the beginning of the colon denuded, and will think that these intestines have descended into the scrotum, without the usual hernial sac formed by the peritoneum. But he will very soon discover the error into which he has fallen, if he make the incision precisely in the middle, and a little towards the inner side † of the tumor. Then under the sheath of the cremaster and the subjacent cellular substance, he will without doubt find the true hernial sac formed by the peritoneum, and within this sac he will see the greater portion of the cæcum with the appendix vermiformis, and likewise the membranous folds and bridles which seem to be detached from the hernial sac, to be inserted into these intestines, the smaller portion of which will be without ‡ the sac, in the same manner as when these viscera occupied the ileo-lumbar region. In the dead body of a man who had a very large hernia of this species, I found that the viscera descended into the scrotum, had been, to use the expression, turned round their axis, so that their union with the hernial sac had been carried from the posterior to the anterior

* Lateral aspect. † Mesial aspect. ‡ Peripherad of.

surface * of the tumor, in consequence of which, I found it impossible to discover the hernial sac, until I again made an incision into the hernia towards the inner side † of the tumor. This combination is what, in my opinion, has led the young surgeon Sernin (*a*) into an error with regard to this hernia. For, he mentions that in practising surgical operations on the dead body, he undertook the operation of scrotal hernia on a subject which opportunely presented a tumor of this species, as large as the fist, situated in the right side of the scrotum. After dividing the common integuments, he continued to separate the subjacent cellular substance to a great depth, without meeting with a hernial sac. Finally, he succeeded in discovering the intestine, and found that it was the cæcum with the extremity of the ileum, and the beginning of the colon, but denuded and entirely unprovided with hernial sac. From this he concluded, that hernia sometimes forms in the scrotum without the sac of the peritoneum, and consequently without a hernial sac, to which he gave the name of *entèrocéles akystiques*. But from what I have just mentioned, it clearly appears from whence this error arose. And it ought not to excite surprise, that a young surgeon should be deceived with regard to the nature of

* From the dorsal to the sternal aspect. † Mesial aspect.

(*z*) Journal général de méd. par Sedillot, T. xvi. pag. 302.

this disease, since we now know, that the same mistake was committed by two celebrated masters of the profession, Dessault and Chopart (*b*), who said openly, that they had seen *the cæcum denuded under the integuments of the scrotum*, without at all suspecting, that the greater portion of this intestine was included in the hernial sac formed by the descent of the peritoneum, as in hernia in general.

§ 35. Many writers of surgery have mentioned the great difficulties, and sometimes the impossibility of returning into the abdomen the large scrotal hernia formed by the descent of the cæcum, with the appendix vermiformis, and the beginning of the colon, on account of the strong adhesions which these intestines contract with the hernial sac. No one however has hitherto taken into attentive consideration, that these adhesions are not preternatural and morbid, but formed by the natural connections which these intestines have in the abdomen, with the great sac of the peritoneum in the right ileo-lumbar region. And no one has hitherto given a sufficient explanation, why some inguinal or scrotal herniæ, formed by the descent of the cæcum, are found adherent to the hernial sac, without having been ever preceded by any attack of *adhesive* inflammation. Farther,

(*b*) Traité des maladies chirurg. T. ii. pag. 195.

no one has engaged in investigating, why some of these herniæ, in proportion to their size, are free from attachment to the hernial sac, and consequently reducible, others adherent to the hernial sac, and therefore irreducible. The explanation is evident: In the first case, as I have shown, or in the small hernia, the bottom of the cæcum, being free from every attachment in the abdomen, is likewise so in the recent hernia of small size; while, on the contrary, in the large scrotal hernia of this species, the point of attachment of the upper part of the cæcum, and of the beginning of the colon with the great sac of the peritoneum in the ileo-lumbar region, descends so far into the scrotum as to form a part of the hernial sac; all which facts appear clearly from the mere inspection of the seventh and eighth plates of this work.

§ 36. The greatness of the embarrassment which the surgeon must feel, who, ignorant of similar circumstances, has opened the hernial sac, to free from strangulation a large hernia formed by the cæcum protruded far into the scrotum, will appear from the following account of it given by Petit (*c*).

"A strong and robust young man," said he, "begged me to perform the operation for a scrotal "hernia which he had had for several years, and

(*c*) Oeuvres posthumes, T. II. pag. 352.

" which prevented him from following freely his
" usual business. After having repeatedly refus-
" ed him my assistance, the hernia became incar-
" cerated; which, far from distressing him, gave
" him great comfort, being flattered that at last I
" would be prevailed on to operate. In fact, I
" found the necessity of it, and I did not think
" that I ought to wait for the appearance of severe
" symptoms before preparing for the operation.
" Having therefore assembled some surgeons, who
" were willing to give me their assistance with
" their hands and advice, I made an incision
" through the integuments and the hernial sac, I
" then divided what formed the strangulation, and
" proceeded to return the viscera. After having
" returned a portion of the ileum and of the cæcum,
" I wished likewise to replace in the abdomen
" the corresponding part of the mesentery; and
" to do this more conveniently, I directed the in-
" testines to be raised and turned back upon the
" integuments of the abdomen, in order the more
" easily to push the mesentery towards the ingui-
" nal ring; but it was impossible to effect this,
" as the mesentery was too much thickened. It
" would have been necessary to carry the incision
" through the aponeurosis of the external oblique
" muscle, two fingers breadth farther than I had al-
" ready divided it, which would have produced a
" wound so large as to allow a passage for a great
" part of the intestines. The plan adopted, was

" to leave the protruded viscera in the situation " in which they were found, to bring the lips of the " wound together, and to cover the whole with " cloths dipped in a decoction of althea, support- " ed by a suspensory: the patient was bled co- " piously. He rested well part of the night, dur- " ing which the surgeon constantly moistened the " dressings every two hours with the decoction. " Although there was neither pain nor fever, the " patient was bled again. I changed the dressings " thirty hours after the operation, continuing to " moisten them in the same manner. This kind " of dressing was continued for five weeks, after " which the wound healed, and by means of the " application of a suspensory, the patient was " enabled to resume the exercise of his business: " he was a waiter in an inn." Thus far Petit.

In the case now related, after the intestines were raised and turned back, what this celebrated author considered as a portion of the mesentery thickened, was, without doubt, the *natural* attachment which the upper * part of the cæcum, and the beginning of the colon, have with the great sac of the peritoneum within the abdomen along the right side, which, in the case above described, had descended into the scrotum to form a part of the hernial sac. And this *natural fleshy* adhesion, from its great extent, and from the considerable

* Atlantal portion.

vessels to which it serves as a support, could not have been cut away without a large portion of intestine being laid bare: which would have been followed by hemorrhage into the cavity of the abdomen, inflammation, and suppuration of the intestinal canal. These circumstances rendering the complication obscure and perplexing, did not however lead this skilful practitioner into error with regard to the manner of completing the operation; consequently this practical fact will be always a valuable document of the art of surgery, from having taught us the possibility of saving the life of a patient with scrotal hernia, although, after removing the immediate cause of the strangulation, it be impossible to make the viscera return completely into the cavity of the abdomen.

§ 37. Verdier (*d*) has recorded a case not less interesting than the preceding, drawn up from an operation performed by Petit, upon a corpulent patient affected with a scrotal hernia of the left side, in whom, after dividing the hernial sac, it was impossible to reduce the protruded loop of intestine. From the statement of the circumstances of the case, it appears that this hernia was formed by the descent into the scrotum (*e*) of that portion of the left colon which is naturally united to the

(*d*) Acad. R. de chirurg. T. XI. pag. 498.
(*e*) Pl. VIII. fig. 1.

great sac of the peritoneum in the left ileo-lumbar region, a little above * the great iliac vessels. However this may be, it is a certain fact, that the intestine, after the removal of the strangulation, was left without † the abdomen, and treated merely with the application of cloths dipped in a decoction of althea, arranged over and around the scrotum, so that they served at the same time as a *suspensory*. This dressing was continued for two months. In the mean time, the suppuration of the lips of the wound, and the general emaciation of the patient, allowed, as the author expresses it, the intestine to rise daily towards the inguinal ring. The bottom only of the loop of intestine remained in the vicinity of the ring without ‡ the abdomen. Notwithstanding, the exfoliation of this portion of the intestine which remained externally §, and the granulation, formed a point of support to the cicatrix of the whole wound, gradually proceeding from the circumference to the centre, and the wound healed completely. The patient was cured, with the exception of being obliged, during the rest of his life, to wear a truss with a *concave* pad, in order to guard from pressure the small portion of the fold of intestine remaining externally ||, which was

* Atlantad of. † Peripherad of. ‡ Peripherad of.

§ Peripherad. || Peripherad.

united to the integuments by a common cicatrix. Sernin *(f)* very lately communicated to the Medical Society of Paris, that his father had observed a case perfectly similar to this, the event of which was equally fortunate.

§ 38. Arnaud (*g*) met with a scrotal hernia formed by the cæcum and the beginning of the colon, complicated with adhesion and gangrene at the same time. "In 1732, I was sent for," says he, "to attend M. Doudevill, a man about "sixty years of age, who had had a scrotal hernia "for twenty years, twenty seven inches in cir- "cumference, which extended down to the middle "of his thigh. The tumor was soft, and appa- "rently likely to be reduced. The patient said, "that within four or five years, the hernia had "occasioned him colics, and that it was only for "five days that it had excited nausea and vomiting, "although he passed flatus by stool. From these "circumstances," says Arnaud, "I was aware "that the hernia was *adherent*, and that therefore "nothing could be attempted but the operation. "Therefore, having opened the tumor, I found "that it contained a portion of the ileum, the "cæcum and the beginning of the colon, for about "ten inches in length. The intestines were ad-

(*f*) Journal de méd. de Sedillot, T. XVI. pag. 306.

(*g*) A dissertation on Hernias, part II. obs. xvii.

" herent to the hernial sac, and to each other, and " were even gangrenous at several points. I em- " ployed an hour and a quarter in dividing the " adhesions and bridles which connected the co- " lon to the hernial sac, and at last being at a loss " what method to follow in order to finish the ope- " ration, I resolved to cut away the whole mass of " the protruded intestines, close to the inguinal " ring; it was necessary, however, to take some " precautions to avoid hemorrhage. I began by " tying, one by one, the vessels of that part of the " mesentery which supported the ileum; then " those of the mesocolon; after which I cut away " all that mass of intestines in the vicinity of the " inguinal ring. There was no reason to hope, " that nature or art could have re-established the " continuity of the intestinal canal, as the ileum, " the cæcum, and the beginning of the colon were " so twisted together, the colon having passed " over * the ileum towards the inner † side, and " the ileum towards the outer ‡ side; and both of " these intestines had contracted strong adhesions " with the edges of the inguinal ring. But as " even after the recision of the whole mass of " protruded intestines, the feculent matter did not " pass out freely by the wound, I introduced a bis- " toury into the ileum, and with one stroke divid- " ed that intestine laterally along with the ingui-

* Sternad of. † Mesial aspect. ‡ Lateral aspect.

" nal ring; after which the feculent matter passed " out abundantly by the wound, and continued " to be discharged for twelve hours, with great " relief to the patient. The dressings consisted " of a pledgit spread with the yolk of an egg, " supported by some compresses. Notwithstand- " ing the many ligatures made upon the vessels " of the mesentery and mesocolon, hemorrhage " occurred during the removal of the mass of in- " testines, and re-appeared during the night, in " consequence of which it was necessary to have " recourse to topical astringents and compression. " On the day after the operation hiccup came on, " which continued three or four days, and then " was stopped by the use of large doses of opium. " In six weeks the patient was cured, with the ex- " ception of a fæcal fistula with which he was " afterwards affected."

§ 39. From the whole of this account, it clearly appears, that even Arnaud was not acquainted with the real nature of this disease, or the true kind of adhesion of the intestines with the hernial sac; for if he had been aware of it, he would undoubtedly have abstained from employing an hour and a quarter in dividing, without any benefit, the pretended unnatural adhesions which united the cæcum with the beginning of the colon to the hernial sac, and would have confined himself to the treatment which is adapted for herniæ not

reducible and gangrenous. For, as to the ligature, singly, of the vessels of the mesentery and of the mesocolon, before the cutting away of the mass of intestines protruded and twisted together, besides being very difficult to perform, the fact has proved, that it can never be practised with such care and precision as is requisite for restraining the hemorrhage in the act of cutting away the intestines, and after their removal. In like manner, with regard to the recision of the protruded and irreducible viscera, solely because they were twisted together, and partly gangrenous, this is not, in my opinion, a precept to be followed; experience having shown, that in similar cases it is less dangerous for the patient to divide the gangrened portion of the intestine lengthwise, and along with it, if necessary, the neck of the hernial sac with the inguinal ring, in order to allow a free issue to the feculent matter, than to cut away the irreducible intestine still possessed of vitality; for however small the vital power existing in it, the cutting away of the intestine only increases the severity of the symptoms of local and general irritation. On the other hand, in a case of hernia, by fomenting the irreducible portion of the intestine, the gangrenous parts of it are insensibly detached from the sound, and those which preserve their vitality exfoliate, form granulations, and are at last covered with a common cicatrix with the wound of the integuments.

§ 40. Whenever therefore it happens that a scrotal hernia of the right side is to be operated on, which is very large and of long standing, with symptoms of strangulation, it will be prudent in the surgeon to examine, in the first place, whether there is reason to suppose that the tumor is formed by the descent of the cæcum with the appendix vermiformis and the beginning of the colon. He will have great reason to suspect that such is the complication of this disease, if the hernia of the right side of the scrotum, besides being very large and of long standing, be also of an irregular shape and knotty. These suspicions will increase if the hernia, as long as it was inguinal and of moderate size, was reducible, and was not so, or incompletely, after descending to the bottom of the scrotum, without however ever having been affected with inflammation or threatened with incarceration. Farther, if in proportion as the hernia enlarged, it has occasioned habitual colics *from irritation*, without symptoms of interruption to the course of the feces, which colics have been always relieved by the use of gentle purgatives and of repeated glysters with evident diminution of the bulk of the tumor. If the patient complains of having been troubled almost habitually, after digestion, with a sense of weight and dragging in the scrotum, and almost always a little before going to stool; if, in the right ileo-lumbar region of the patient there is an evi-

dent depression, a pit proportioned to the size of the hernia; if, finally, the incarceration has been produced rather by great irregularites in diet, and therefore by accumulation of ill digested substances, than by violent exertion, with descent of a mass of intestines greater than what existed in the scrotum a little before, the doubts will increase that the tumor is formed by the descent of the cæcum with its appendix and the beginning of the colon. In these circumstances, and in this particular species of hernia, the symptoms of incarceration are almost never very urgent, both on account of the size of the neck of the hernial sac, and the weakness of the aponeurosis of the *external* oblique and of the inguinal ring; which is also common to all large and old scrotal herniæ, although formed by the descent of the small intestines. However, the symptoms of incarceration, in whatever case of hernia, ought not to be confounded with those produced by colic *from irritation* depending upon the adhesion of the viscera to the hernial sac. That the latter is the case may be inferred from this, that in the incarceration of old and large herniæ there is a total suppression of the alvine discharge, pain in the hernia, vomiting, hiccup, fever; while in the colic *from irritation*, similar in appearance to strangulation, the feculent matter and flatus pass uninterruptedly *per anum*, and the discharge of them is increas-

ed by the use of purgatives and glysters, and if there is nausea and tendency to vomiting, it is only at long intervals; there is not properly speaking fever, and the hernia, although increased in size and tense, is not very sensible to the touch. In these circumstances, experience has taught us not to have recourse too eagerly to the operation for hernia, and to put great confidence in gentle emollients, frequent glysters, and cold applications to the hernia.

But supposing, that a large and inveterate hernia formed by the cæcum is actually affected by strangulation, so that the operation is absolutely necessary for freeing the patient from so dangerous an accident, the surgeon will prepare for it, guided by the reflection that the protruded viscera, on account of their particular connexion with the hernial sac, are not susceptible of being completely returned into the abdomen. On which account, there not being the smallest suspicion of gangrene, and knowing likewise that in this case, as in all those of large and old scrotal hernia, the neck of the hernial sac is never the immediate cause of strangulation, the surgeon having divided the common integuments, will lay bare the inguinal ring, and will divide it from* without with his hand unsupported, taking care not to wound the subja-

* The dermal aspect.

cent neck of the hernial sac, in such a manner as to set the protruded viscera at liberty, without exposing them to the contact of the air, and by gentle pressure on the tumor he will make the accumulated feces and flatus resume their course, and will, at the same time, endeavour as much as possible to return the protruded viscera. If, however, from inadvertence, or the absence of marks sufficiently certain of the descent of the cæcum, or because there are marks of gangrene, the hernial sac has been opened, the surgeon, in similar circumstances, will adhere to the conduct followed by Petit, viz. he will divide what forms the strangulation, and will return into the abdomen all the sound portion of intestine which is disposed to return; then he will cover the viscera with the sides of the hernial sac, and with those of the incision of the scrotum, and will surround the whole with soft cloths dipped in the decoction of marsh mallows or of althea, which he will take care to moisten every two hours day and night. In progress of time, having never neglected the usual internal and external remedies employed after operations for incarcerated hernia, nature by her own powers alone will draw back into the cavity of the abdomen a part of the viscera adhering to the hernial sac, and the part of them remaining externally will exfoliate and be covered with granulations, and will be included in the common cicatrix with the integuments of the groin

and of the scrotum. A greater or smaller tumor will undoubtedly remain in the groin, according to the greater or smaller portion of cæcum retained externally*; to guard this from pressure, and to prevent it again increasing in bulk in the course of time, the patient will wear all the rest of his life a truss with a *concave* pad. Finally, it is proper to observe, that the rule just laid down with regard to the treatment of large and old hernia formed by the descent of the cæcum and the beginning of the colon in a state of incarceration, is likewise common and applicable to all cases of large scrotal hernia formed by the other intestines, and without adhesion of any kind to the hernial sac, but which, merely on account of their great bulk, are no longer susceptible of reduction, and have, to use the expression, lost the right of domicile in the abdomen.

§ 41. I have demonstrated, that the free and moveable portion of the cæcum, may form a hernia in the groin without the membranous folds and bridles which connect the upper † part of the intestine, and the beginning of the colon, to the great sac of the peritoneum in the right ileo-lumbar region, passing out of the inguinal ring. In this case, the complete replacement of the cæcum is always possible before

* Peripherad. † Atlantal.

the incarceration, or after the immediate cause of this accident is removed. And if even, in consequence of the strangulation, the cæcum were attacked by gangrene, the natural course of the feces would not be interrupted on that account, as in other cases of mortified hernia; or if an interruption did occur, it would only be for a short time. This assertion, indeed, does not require proof, to any one who is acquainted with anatomy. At any rate, it will not be without advantage to relate the following case with regard to this point: —" A man about thirty (*h*) was attacked with all " the symptoms of strangulation of an inguinal " hernia of the right side, which he had had for a " long time. He remained in this miserable state " for a fortnight. At last, when a surgeon was " called, the gangrene affected the scrotum and " the intestine. After the separation of the gan- " grene, the excrements passed out by the wound " for a short time; they then resumed their natu- " ral course, and in the space of a month the pa- " tient was perfectly cured. Thirty-two years " afterwards this patient died of a quite different " disease. The desire of knowing how, after the " loss of a portion of the intestinal canal, the feces " had resumed their natural course so speedily, " induced Mr Bent to make an exact examina-

(*h*) Med. observ, and enquiries, T. III. p. 64. See also Plate XII. fig. 2.

" tion of the body of this man. He found that " the gangrene had only destroyed the cæcum " with the appendix vermiformis, and that the " termination of the ileum and the beginning of " the colon had remained uninjured, by which " means the passage of the feculent matter, from " the small to the large intestine, had been pre- " served free and unimpeded." In the annexed figure it is clearly seen, that in the formation of the hernia, the bridles and membranous ligaments of the upper * part of the cæcum, and of the beginning of the colon, had descended into the vicinity of the inguinal ring (*i*), but had not passed through it.

§ 42. To the complications of incarcerated hernia is referred that state of the protruded omentum, in consequence of which, after the removal of the immediate cause of the strangulation, its return into the abdomen is not proper, or for many reasons is not possible. In similar circumstances Arnaud (*k*), especially when the protruded omentum was inflamed, ecchymosed, contused, hard, steatomatous, very large, and adhering to a great extent of the hernial sac, used to tie it firmly in the vicinity of the inguinal ring, at the same time that he was prepared to cut the ligature, on

* Atlantal.

(*i*) Pl. XII. fig. 2. d.

(*k*) Mém. de chirurg. T. II. pag. 627.

the first appearance of consentient symptoms affecting the stomach and intestinal tube, such as nausea, vomiting, hiccup, acute pains of the abdomen, especially around the umbilical region. Verdier (*l*), Piplet (*m*), Pouteau (*n*), Pott (*o*), keenly opposed this practice, asserting that the ligature of the omentum was always hurtful, and ought to be banished entirely from surgery. Being puzzled by the opposite doctrine of these skilful practitioners, but especially by Arnaud's direction to be upon our guard against the consentient symptoms, and on their first appearance, to cut the ligature, (which shows that it is a very doubtful and dangerous practice,) I have for a long time adopted a middle way between these two modes of treating the omentum, when protruded and unsusceptible of reduction, and I have applied to the treatment of hernia, and practised in this case precisely the mode I had seen used in my early youth, and have likewise employed myself with perfect success, in cases of penetrating wound of the abdomen with protrusion of omentum, which for various reasons had not been reduced. I had repeatedly observed, that the protruded portion of omentum sometimes shrivelled, and fell off spontaneously; but that in most cases the protruded mass of omentum, instead of becoming mortified,

(*l*) Acad. R. de chirurg. T. VII. (*m*) Idem. T. VIII.
(*n*) Oeuvres Posthumes, T. III. pag. 163.
(*o*) Chirurgical Works, T. III. pag. 259.

revived, and assumed the appearance of a reddish fungus, which suppurated over its whole surface, without showing the smallest tendency to separate from the wound, although two weeks had elapsed after the accident. In other similar cases, I had observed, that very formidable consentient symptoms had arisen, soon after the tight ligature of the omentum applied a few days after the prolapsus of a portion of this viscus from the abdomen, or when the protruded mass of omentum was in the inflammatory state, on account of which symptoms it was necessary to cut the ligature as quickly as possible, conformably to Arnaud's direction. On the other hand, whenever the reddish fungus of the omentum, some days after the accident, was covered with mucous suppuration, with incipient exfoliation of its surface, and evident signs of adhesion contracted with the lips of the wound of the abdomen, the ligature of this reddish mass of omentum, moderately tight at first, and then gradually tightened, has always produced the death and separation of the mass, without occasioning the patient considerable pain, or any kind of consentient disorder of the abdominal viscera.

According to these observations, therefore, I have regulated my practice in those cases of incarcerated hernia, in which the omentum, for the above mentioned reasons, was not capable of being returned into the abdomen. In simi-

lar cases, after freeing the omentum in hernia, not only from the strangulation, but from any adhesion to the hernial sac, except what it might have contracted with the neck of the sac in the region of the inguinal ring, I have been in the practice of covering all the protruded portion of omentum with fine old linen spread with simple ointment, or storax ointment, in order to prevent it, while remaining in the position in which it was found, again contracting adhesions with the hernial sac, or with the lips of the wound of the scrotum. After the abatement of the symptoms consecutive to the operation, and the commencement of the mucous suppuration of the surface of the omentum retained externally *, (which takes place ten or twelve days after the operation,) I apply a ligature round the omentum in the vicinity of the inguinal ring, which I draw moderately tight during the first days; I afterwards tighten it gradually, until the whole reddish fungous mass becomes livid and black, and is at last completely separated from the sound, in the vicinity of the ring. The precaution of wrapping in a pledgit the omentum retained externally †, is quite necessary; since, by doing otherwise, the omentum, left in the position in which it was, again contracts adhesions with the adjacent parts, occasioning collections of matter between the

* Peripherad. † Peripherad.

omentum and the hernial sac, which descend to the bottom of the scrotum, and oblige the surgeon to make incisions into the scrotum, which might have been avoided. Lastly, the remaining protruded portion of omentum is included in the common cicatrix, with the integuments of the groin and of the scrotum, and leaves a greater or smaller tumor in the place which was previously occupied by the hernia. However, if we do not wish to employ the ligature, after the appearance of the suppuration of the surface of the omentum, this swelling in the groin may be prevented, by destroying the omentum layer after layer, by the application of escarotics; but this treatment is tedious and painful to the patient (*p*).

(*p*) According to Celsus, the caustic is preferable to the ligature, because the former, he says, causes the separation of the omentum more quickly than the ligature. "*Considerandum autem* est, majorne is modus, an exiguus sit. Nam "quod parvulum est, super inguen in alvum vel digito, vel "averso specillo repellendum est: si plus est, sinere oportet "dependere, quantum ex utero prolapsum est; idque adurentibus medicamentis illinire, donec emoriatur et excidat. "Quidam hic quoque duo lina acu trajiciunt, binisque singulorum capitibus diversas partes adstringunt; sub quo æque, "sed tardius emoriatur. Adjicitur tamen hic quoque celeritati, "si omentum supra vinculum illinitur medicamentis quæ sic "exedunt, ne erodant." *De Med. Lib. VII. cap.* 21. I do not think that it is easy to determine what are the caustic substances, *quæ sic exedunt ne erodant.* However, experience has taught me, that red precipitate mixed with alum, only attacks the surface of the omentum, and makes it separate in layers.

Farther, the wrapping the omentum in the pledgit of ointment, during the time required for allowing the abatement of the inflammation, consecutive to the operation, and the waiting for the suppuration, do not cause the protruded portion of omentum, to lose the opportunity and disposition to assist the powers of nature, which always has a tendency to draw back a portion of it into the abdomen, whenever the adhesion of the omentum to the neck of the sac at the ring, and within * the ring, does not form an unsurmountable obstacle. And if even the portion of omentum which returns, were in the suppurating stage, the life of the patient would not consequently be in danger; because the part of the omentum remaining external † to the inguinal ring, would serve as a guide and track to the discharge of the matter, and of the corrupted portions of omentum as they were separated from the sound (*q*).

* Centrad of. † Peripherad.

(*q*) When the omentum is so bulky that it cannot be returned, or is mortified, Mr. A. Cooper advises it to be removed by the knife. The surgeon raises the omentum, while an assistant holds it firmly higher up, to prevent it slipping into the abdomen, the surgeon then cuts it off near to the mouth of the sac. The bleeding arteries are to be secured with a fine ligature, and after the hemorrhage has ceased, the omentum is to be returned with its divided surface close to the mouth of the sac, from which the ligatures hang out. Mr. Cooper also observes, that it is sometimes necessary to cut away the omentum from its being in a scirrhous state. *Loc. cit.* p. 32. T.

Finally, a point deserving the greatest attention, in all this matter concerning the irreducible omentum, is the application of the proper dressings after the operation, and the manner of retaining them applied. It is improper to fill the upper * part of the hernial sac with pledgits of lint, and still less to place any compress, however soft, upon the ring. And for retaining the dressings, it is improper to apply the *spica* bandage, which compresses the upper † part of the ring, and the portion of the wound from the groin to the scrotum. This would serve to excite consentient symptoms, such as usually follow the premature ligature of the protruded mass of omentum. It is sufficient to use a large pledgit spread with ointment of wax and oil, and a suspensory which gently surrounds and supports the scrotum.

§ 43. In the preceding memoir (*r*), I have mentioned some complications depending upon watery tumors of the spermatic cord, or of the vaginal coat of the testicle accompanying scrotal hernia, to which may be added, that arising from a great quantity of serum in the hernial sac. Whatever difficulty these complications may oppose to the exact diagnosis of reducible intestinal scrotal hernia, they do not occasion any with regard to the

* Atlantal. † Atlantal.

(*r*) § 31

operation, whenever the hernia is affected with strangulation; as the symptoms accompanying the incarceration of the intestine show clearly the nature of the principal disease, and render the operation necessary, by means of which we have at the same time the advantage of laying bare what formed the complication of the hernia, and of curing radically both diseases. The two following cases will tend to elucidate this point.

A student of medicine, about twenty-nine years of age, was unfortunately attacked with incarceration in a hernia, which he had had for more than fifteen years, in the left side of the scrotum, to which he had never been able to fit a proper bandage, because at first he could not bear the pressure, however slight, and because, after the enlargement of the tumor, the protruded parts had no longer been susceptible of complete reduction. On the first appearance of the symptoms of incarceration, he had called in to his assistance the late M. Cera, chief surgeon of this hospital, and then also wished to have my opinion. The hernia was tense and above the moderate size, and had a situation to which I had never observed any thing similar, as the bottom of the tumor was unusually raised, and as it were pushed upwards *, by a body situated behind the hernia, which body was undoubtedly not the testicle, as it was felt

* Atlantad.

distinctly by the touch in the bottom of the scrotum, and lower* down than the hernia. The symptoms of strangulation being very urgent, the above named surgeon proceeded to operate in my presence. The hernial sac was found to contain a very small quantity of water, and a loop of small intestine slightly tinged of a brown colour, and about three or four inches in length. Having divided the neck of the hernial sac and the ring, and also reduced the intestine, there still remained externally† a soft tumor, elastic, and evidently full of fluid. An incision was made into this tumor, and a considerable quantity of serous fluid discharged. At the bottom there appeared a vesicular gelatinous substance, which was raised with the forceps and cut away with a pair of scissars, and it was clearly perceived, that the intestinal scrotal hernia was accompanied posteriorly‡ with an incysted hydrocele of the spermatic cord. In the course of six weeks the patient was completely cured of both these diseases.

The following is an example of hydrocele of the hernial sac, complicated with intestinal scrotal hernia. On the 12th December, 1807, Dominic Ordarini, from Rognano, was brought to this school of surgery; he was a young man, twenty-five years of age, stout and very fat, affected with incarcerated scrotal hernia of enor-

* More sacrad. † Peripherad of the ring.

‡ On the dorsal aspect.

mous size. He said that the hernia was of eight years standing, the effect of a violent exertion; that the day before the incarceration, being obliged to make a rapid journey on horseback for an hour and a half, his truss had broken before he had gone half of the journey, and that, on alighting from his horse, he had found the scrotum of extraordinary size; he was likewise affected with nausea, acute pain in the groin, and inclination to vomit. The tumor was fully sixteen inches in circumference, and from its size almost entirely concealed the penis; it was broad at the bottom, narrow at the upper* part towards the ring, equal and smooth in almost its whole surface, and elastic. It resembled a large hydrocele, and might have been taken for one, if besides the preceding appearances, there had not been evident marks of incarcerated intestine. I could with difficulty persuade myself, that this large tumor was formed, for the most part, by water collected in the vaginal coat of the testicle, or in the hernial sac, as the patient never had the smallest mark of serous effusion in the scrotum, as well as because, from the repeated assertion of the patient, the hernia in the course of eight years had never exceeded the size of a hen's egg, and there was no reason to suppose that so much water had descended from the cavity of the abdomen into the scrotum in a

* Atlantal.

young man in other respects very healthy and strong. I rather suspected, considering the fatness of the patient, that by the exertion of the riding, a great mass of omentum had descended, although there still remained some doubt, how, in so short a time, the hernial sac could have yielded to so great a distension, and because the tumor had rather the appearance and elasticity of a large hydrocele than of a large hernia composed of intestine and omentum. The point, on which there could be no doubt, was the impossibility of reducing the parts without an operation, as the symptoms of strangulation increased in violence every minute. On the first cut into the hernial sac, about three pounds of yellowish serum were discharged, and with such impetuosity as if a large hydrocele had been opened. It was a common scrotal hernia. At the upper* part of the sac, a loop of small intestine, about two inches long, appeared, slightly ecchymosed, and not the smallest portion of omentum. After removing the immediate cause of the strangulation, the intestine was returned. The patient immediately had abundant alvine evacuations, and the cure went on regularly; the dressings were never found covered with serum proceeding from the cavity of the abdomen. In seven weeks the wound was completely healed.

* Atlantal.

MEMOIR THIRD.

OF FEMORAL HERNIA IN THE MALE.

§ 1. The femoral hernia is frequently met with in women who have had many children; very rarely in girls; and still more rarely in the male. In the latter it is observed, that the protruded viscera find greater facility in following the course of the spermatic cord, causing a separation of the inguinal ring, than in descending along the great femoral vessels, occasioning the elevation of the rigid margin of the aponeurosis of the *external* oblique muscle, or *femoral* arch (*a*). Precisely the contrary happens in females, be-

(*a*) A boy about seven years of age, had forced the left testicle into the abdomen; ten years afterwards, the inguinal ring having probably become unusually contracted, the testicle passed under * the femoral arch, with all the symptoms of strangulated hernia, on account of which he was obliged to undergo the operation. See Journal de méd. Vol. XVI. Janvier, 1809.

* Centrad of.

cause in them the *round* ligament of the womb which leads to the ring, is very small, and their pelvis is large compared with the male, and because the inguinal ring is much constricted, and situated lower * than in the male, and nearer to the pubes. Morgagni (*b*) wrote, that he had never had an opportunity of examining this species of hernia in the dead body of the male sex. Camper (*c*) mentioned the same circumstance. Hevin (*d*) relates that he had operated on a very considerable number of femoral herniæ in the female, but on only one in the male. Sandifort (*e*) and Walter *(f)* only dissected this

* More sacrad.

(*b*) De sed. et caus. morb. Epist. XXXIV, 15. Mihi, ut verum fatear, nondum nisi in fœminis accidit, ut eam viderem.

(*c*) Icones hern. in præfat. De bubonocele sola scribo, quoniam nihil certi mihi de hernia femorali constat. Frequentem hanc esse in fœminis, etiam in viris novi, iisdemque symptomatibus premi; sed nondum mihi licuit attente secare femoralem herniam. Consultius ergo duxi nihil omnino de hac speciali hernia dicere, quam repetita et obscura proferre.

(*d*) Patholog. et Therap. pag. 406.

(*e*) Observ. Anat. patholog. cap. IV. pag. 72. In cadavere viri 50 circiter annorum, in quoque latere aderat saccus pollicem cum dimidio longus a peritonæo formatus, qui juxta vasa cruralia descendens, sub margine musculorum abdominalium egrediebatur, et totus quidem vacuus, sed tantæ capacitatis erat, ut sine dubio intestinorum portionem antea admiserat, et facillime etiam admittere poterat.

(f) Syloge comment. anat. pag. 24. observ. 21. Semel tantum mihi contigit abhinc inter tot cadaverum humanorum

species of hernia once in the male subject. Arnaud also (*g*), to whom modern surgery is indebted for so many important precepts, with regard to the operation for strangulated femoral hernia in both sexes, confessed ingenuously, that he had never had an opportunity of dissecting this species of hernia in the male subject. On which account, there is no doubt, that all this distinguished practical writer has taught, with regard to the relative position of the spermatic cord and epigastric artery, and the neck of the sac of the femoral hernia in the male, as well as the judicious direc-

extispicia herniam femoralem non mediocris magnitudinis anatomico oculo examinandi. Mense Februario 1780, in cadavere masculino mendici 50 circiter annorum tumorem magnitudinis pugni infra ligamentum fallopianum dextri cruris animadverti. Cum mihi tunc vasa hujus cadaveris cera replendi opportunitas deesset, recenti in statu sub cautissima partium administratione in naturam hujus herniæ cruralis inquisivi. Præparatis itaque ante omnia partibus externis, remotaque cute, fascia-lata et contextu celluloso nectente, saccus herniæ satis accurate medium locum inter musculum sartorium et gracilem occupavit, et aliquantisper latiore sua expansione pectineum obtegebat, et majoribus vasis, arteriæ nempe, venæque crurali et saphenæ, et etiam nervo crurali incumbebat ita quidem, ut si urgente necessitate operatio administranda fuisset, absque omni periculo institui potuisset; nam teneriores venæ epigastricæ externæ, et nervi inguinalis surculi nullius momenti erant. Hiatus sub ligamento Fallopii per quem hernia facta fuit, fere duos pollices longus et integrum pollicem latus erat; pars autem prolapsa jamdudum cum sacco firmissime coaluerat.

(g) Mémoires de chirurg. T. II. pag. 782.

tions to surgeons, with regard to the operation in the case of incarceration of this hernia in the male, were only drawn by him from the examination of these parts in the body of a man not affected with hernia, and applied to the hernial patient. And, although in the pathological demonstration of this disease, this celebrated surgeon has approached very nearly to the truth, yet, the want of the hernial sac in the body he examined, and consequently there being no displacement of the fallopian ligament, or femoral arch, has caused the plate delineated by him, on the relative situation of the spermatic cord and epigastric artery with the neck of the sac of the femoral hernia, not fully to answer the intention with which it was published, and left in the mind of several illustrious masters of the art, the reasonable doubt, that the relative position of the spermatic vessels, and of the epigastric artery, with regard to the femoral arch, was different in the healthy subject from what it was in the one affected with hernia. I have thought it consistent with the perfection of the art, to remove all doubt upon a subject of so much importance. Therefore, an opportunity having offered to me of dissecting this species of hernia in the male subject, in which the blood vessels had been previously injected, I thought that it would be useful and agreeable to surgeons, to present to them, as far as was possible, an exact representation of the parts

constituting this disease, and of their relations with the neighbouring parts; from this the danger of fatal hemorrhage to which males are exposed appears very evident, in the event of their being obliged to undergo the operation for incarcerated femoral hernia, when the surgeon does not use those precautions which the particular circumstances of the strangulated viscera require in this case.

§ 2. The femoral hernia in the male, as in the female, is formed in the cellular substance accompanying the great iliac and femoral vessels under* the Fallopian ligaments, on the *inner*† side of these great vessels, or between these vessels and the pubes, and descends in the bend of the thigh between the sartorius, gracilis, and pectineus muscles. Several surgeons suppose, that in general the descent of the sac of the peritoneum, and of the viscera contained in it, takes place immediately above‡ the great femoral vessels, and on the trunks of the saphena vein, and sometimes even between these vessels and the anterior and superior spine of the os ilium, but none of them, as far as I know, have confirmed the truth of their assertion with one well detailed pathological fact of incipient femoral hernia. For it is a well

* Centrad of.

† Mesial.

‡ Dermad of.

known fact, that a femoral hernia, when in the course of time it has become very large, and its fundus has inclined down* the bend of the thigh, covers partly or entirely the large femoral vessels, and even the anterior femoral nerve, as Walter asserts (*h*), but it does not follow from this, that at the commencement of this hernia the viscera have been protruded immediately above† the great iliac and femoral vessels, and still less, that their descent has taken place between these vessels and the anterior superior spine of the ilium, as if the neck of the hernia and the opening of communication between it and the cavity of the abdomen had been removed from the *internal* ‡ to the *external* § side of the femoral vessels. At least it may be affirmed, from the numerous facts to the contrary, that both of these cases are very rare; for it is a well known fact, that careful practical observers, and surgeons well skilled in these operations, where they mention femoral hernia in the female or in the male, all agree in having constantly found, in the act of operating, the intestine or omentum, or both, descending along the *inner* ‖ side of the large femoral vessels, or between these vessels and the pubes, never between them and the ilium. And, although the body of the hernia

* Distad on. † Dermad of. ‡ Mesial.

§ Lateral. ‖ Mesial.

(*h*) Loco supra cit.

be carried transversely over the femoral vessels, the neck of the tumor and its communication with the cavity of the abdomen, have always been found situated between the femoral vessels and the pubes. Le Dran(*i*), La Faye(*k*), Petit(*l*), Morgagni(*m*), Arnaud(*n*), Günz(*o*), Bertrandi(*p*), Pott (*q*), Dessault(*r*), Bell(*s*), Richter(*t*), Nessi(*u*), Las-

(*i*) Observ. de Chirurg. T. II. pag. 2.

(*k*) See Dionis, pag. 358. Les parties flottantes du bas ventre s'échappent quelquefois par-dessous cette arcade, et c'est ordinairement du coté de l'angle qu'elle fait avec l'os pubis; parceque les parties trouvent moins de résistance de ce coté, et que l'homme étant debout, cet endroit de l'arcade est le plus bas.

(*l*) Œuvres Posthumes, T. II. p. 219.

(*m*) De sed. et caus. morb. Epist. XXXIV, 15. Ad cruralia autem vasa, quibus a latere *interno* adjacebat annexus sacculus.

(*n*) Mémoires de chirurg. T. II. pag. 768.

(*o*) De herniis libellus, pag. 78. Inter has partes adeo, sed potissimum ab *interno latere*, via ad femur ducit, per quam intestinum cum omento prorumpit.

(*p*) Trattato delle operaz. T. I. anot. pag. 218.

(*q*) Chirurgical Works, T. II. p. 152.

(*r*) Traité des malad. chirurg. pag. 191.—195.

(*s*) A System of Surgery, T. I. p. 387.

(*t*) Traité des hernies, chap. XXXIV. Ordinairement les parties s'echappent par *l'angle interne ou inferieure* de cette ouverture, qui est derigé vers la symphise du pubis.

(*u*) Instituz. chirurg. T. II. pag. 198.

sus(*x*), and several other writers on this subject, are unanimously of the same opinion on this point, and I can confirm their doctrine by numerous observations of my own on cases of femoral hernia, operated on, in both sexes, on account of strangulation, and examined repeatedly in female subjects, and in the male, from which I have taken the annexed plate. In the dead body of a woman, who had a femoral hernia of such a size as to extend beyond the upper third of the thigh, I very lately observed, that the neck of the sac of this hernia did not in the least lie over* the great femoral vessels, but was situated between these vessels and the pubes. Independent of the careful examination of this disease in the dead body, the mere anatomical inspection of the femoral arch and of the parts which pass under† it in the healthy state, appears to me sufficient to show clearly, that there is less resistance to the passage of the abdominal viscera at the *internal*‡ and lower‖ angle of this arch, than in the rest of it, especially towards the ilium; because the superior§ and middle portion of this arch is closed up, to use the expression, by the trunk of the anterior crural nerve, by the large femoral vessels, and by the tendons of

(*x*) Médecine opérat. T. 1. pag. 198.

* Dermad of. † Centrad of. ‡ Mesial.

‖ Sacral. § Atlantal.

the iliacus internus and psoas muscles, and because the *internal** and lower† angle of the femoral arch is the most dependent part of the whole lower‡ margin of the abdomen from the ilium to the pubes. This point is only occupied by a soft and easily distended cellular substance, which, on an extraordinary exertion, is disposed to yield to the descent of the sac formed by the peritoneum, and of the viscera contained in it.

§ 3. The space between the inferior§ and *internal*‖ angle of the femoral arch and the inguinal ring, being only about seven lines in the male of ordinary size, whenever the femoral hernia has acquired a considerable size, so that the bulk of its neck has raised and pushed forwards¶ and upwards** the inferior†† and internal‡‡ angle of the femoral arch, the tumor may approach so near to the region of the pubes and of the ring, as to resemble an inguinal hernia. It is perhaps on this account that Heister (*y*) wished that the inguinal hernia should be distinguished from the femoral by the term of *external*§§ and *internal*‖‖ inguinal, because both of them, in an extended sense, occupy the inguinal region. However, in spite of this approximation of the inferior¶¶ angle of the fe-

* Mesial. † Sacral. ‡ Sacral. § Sacral.
‖ Mesial. ¶ Sternad. ** Atlantad. †† Sacral.
‡‡ Mesial. §§ Lateral. ‖‖ Mesial. ¶¶ Sacral.

(*y*) Institut. chirurg. cap. 118.

moral arch to the inguinal ring, it is not difficult, in my opinion, to distinguish these two diseases from each other, whether they are observed at the very beginning, or when they have acquired their greatest size. For, the femoral hernia, at its commencement, is situated so low down*, and so deep in the bend of the thigh, that it is difficult even in lean persons to feel its neck, and it is not easy with the point of the finger to discover the tendinous ligament of the *external* oblique, under† which the viscera have passed out. The incipient inguinal hernia, on the contrary, however small it may be, is found situated about half an inch above‡ the bend of the thigh, and around its neck we can easily feel with the point of the finger the tendinous edges of the inguinal ring, and the spermatic cord may be discovered and distinctly felt at the lateral and posterior§ part of the tumor. The neck of the femoral hernia of considerable size, is always situated low down‖ and deep in the bend of the thigh, and its body and fundus have an oval shape, the longitudinal diameter of which lies transversely in the bend of the thigh. The inguinal hernia, whether it be small or large, always forms a tumor of a pyramidal shape, the base or fundus of which, instead of inclining towards the ilium, follows the

* So far sacrad. † Centrad of. ‡ Atlantad of.

§ Dorsal. ‖ More sacrad.

course of the spermatic cord directly downwards * towards the scrotum. The femoral hernia also, when of considerable size, besides the symptoms common to all herniæ, occasions peculiar symptoms, such as a sense of numbness and of weight in the thigh, edema of the corresponding leg and foot.

The diagnosis however, between femoral and inguinal hernia, is not equally easy in the female as in the male. Because the want of the spermatic cord in the female, and the inguinal ring being situated lower down † at the inferior ‡ margin of the abdomen, and nearer to the inferior § and *internal* || angle of the femoral arch, than in the male, may easily lead to error, and sometimes even make us suppose, that the same woman is affected with two distinct femoral herniæ on the same side, and under ¶ the same arch, when in fact one of the herniæ is inguinal, and the other femoral. Arnaud (z) has given an instance of this mistake. " A woman," says he, " twenty " six years of age, of a very delicate habit of body, " who had had several very laborious labours, " was affected with a femoral hernia on the right " side, which became strangulated. The hernia " was very prominent, and about the size of an " egg. On opening the hernial sac, I only found

* Sacrad. † More sacrad. ‡ Sacral. § Sacral.
|| Mesial. ¶ Centrad of.

(z) Mémoires de chirurg. T. II. pag. 605.

" a small portion of intestine, equal to the half of " a small nut. The smallness of the loop of the " intestine disproportioned to the bulk of the " tumor, excited my curiosity, and made me sup- " pose that there was another hernia four times " as large as the first towards the pubes. I made " a second transverse incision in the skin, to bring " the tumor better into view; I then opened the " sac which contained a second loop of intestine, " two inches in length. This second hernia was " strangulated by a small bundle of tendinous " fibres, and not, properly speaking, by the fallopi- " an ligament, forming the femoral arch." Arnaud adds, " I dilated it; I then replaced the intestine " in the abdomen, which, although very red, did " not occasion any bad symptoms, and the patient " recovered." This bundle of tendinous fibres distinct from the fallopian ligament, and which separated the one hernia from the other, if I am not very much mistaken, was that portion of the lower * pillar of the inguinal ring, which is situated between that opening and the inferior † and internal ‡ angle of the femoral arch, which intermediate tendinous portion, from occupying a small space in the female, is not sufficient sometimes to point out the distinction between the femoral and inguinal hernia in the female. It is not so in the male.

* Sacral. † Sacral. ‡ Mesial.

§ 4. On removing the common integuments of the femoral hernia in the male, the tumor is found inclosed within a compact cellular substance, interspersed with lymphatic glands firmly united to it. In general, this covering is so loose, that on being laid hold of with the forceps, it may be raised and divided with perfect safety, without injuring the subjacent parts; sometimes, however, by the pressure occasioned by the truss, it is indurated, and adhering to the subjacent aponeurotic sheath of the fascia-lata, and then it is proper to proceed with great caution. Some of the lymphatic glands are not unfrequently so situated, that it is absolutely necessary to divide them, to reach conveniently the hernial sac. Below * this glandulo-cellular layer, another appears entirely aponeurotic, but of unequal density, that is, denser and firmer towards the ilium than in the vicinity of the pubes. This aponeurotic covering of the hernia, is only, in reality, the aponeurosis of the fascia-lata, which is extended upwards †, and spread over ‡ the femoral arch and inguinal ring, and in the male descends over § the cremaster muscle. This aponeurotic web of the fascia-lata, where it is about to pass over ‖ the femoral arch, adheres firmly to the edge

* Centrad of. † Atlantad. ‡ Dermad of.

§ Dermad of. ‖ Dermad of.

of the fallopian ligament (*a*), to which it is so firmly united, that it cannot be separated without laceration (*b*). This adds much strength and elasticity to the fallopian ligament, and contributes very much to keep it tense, and applied, to use the expression, to the bony margin of the pelvis, by which means this ligament is rendered still more capable of resisting the impulse constantly made against it by the abdominal viscera; this use evidently appears very well marked, not only in the dead, but in the living subject. For in the dead subject, on dividing the aponeurosis of the fascia-lata, close to the edge of the fallopian ligament, the femoral arch is immediately observed to relax and rise up *, and to open, as it were spontaneously. And on introducing the finger under † the femoral arch from the cavity of the abdomen, it no longer opposes so strong a resistance to its passage under ‡ it, as it did before the removal of the connexion of the fallopian ligament with the aponeurosis of the fascia-lata, which kept it drawn tense downwards §, and

(*a*) Günz *Libellus de hern.* pag. 76. Intestina vero nullibi sæpius cutem in tumorem attollerent, si vel ligamentum tantum ab ossibus distaret quantum fit fascia-lata resecta, vel si ab eo nihil ad femur descenderet.

(*b*) Plate X. b.

* Sternad and atlantad. † Centrad of. ‡ Centrad of.

§ Centrad and Sacrad.

fixed opposite to the margin of the pelvis. Every practitioner likewise knows, that nothing contributes more to facilitate the return of the viscera protruded under * the femoral arch, as the bending the thigh of the patient.

§ 5. Immediately below † the aponeurotic layer of the fascia-lata, the *proper* cellular sheath of the hernia (*c*) appears. It is formed by the cellular substance, external ‡ to the great sac of the peritoneum, and by that which accompanies the great femoral vessels under § the crural arch, and which is afterwards lost amongst the muscles of the thigh. For, as I have mentioned, in speaking of the formation of the sac of inguinal hernia (*d*), the cellular membrane which connects loosely the great sac of the peritoneum to the muscular and aponeurotic parieties of the abdomen, accompanies the protruded peritoneum forming the hernial sac, along the iliac vessels under ‖ the femoral arch, without undergoing any sort of laceration, but merely a relaxation and elongation of its fibres without interruption of its natural continuity, along with the cellular substance surrounding and accompanying the great femoral vessels out of the abdomen. It is very abundant at the inferior ¶

* Centrad of. † Centrad of. ‡ Peripherad of.

§ Centrad of. ‖ Centrad of. ¶ Sacral.

(*c*) Pl. X. h. h. (*d*) Memoir first, § 18.

and internal * angle of the arch, and insinuates itself between the muscles at the top of the thigh. In the dead body of the man affected with hernia which I examined, on blowing air into the cellular substance, connecting the great sac of the peritoneum to the ileo-lumbar region corresponding to the seat of the femoral hernia, it not only inflated the cellular substance which surrounded the hernial sac without † the femoral arch, but the cellular substance surrounding and accompanying the large femoral vessels of the same side out ‡ of the abdomen, was filled with the air and elevated. In small recent femoral hernia, this cellular sheath surrounding the hernial sac, and situated between the sac and the aponeurosis of the fascia-lata, is easily distendible, while in large femoral hernia of long standing, this cellular sheath is firm and rigid, but never so much so as that which is interposed between the proper hernial sac and the sheath of the cremaster, in old and large inguinal hernia. In small and recent femoral hernia also, the layers of this cellular substance are so very soft and ductile, that they very often allow the small hernial sac to be pushed back with the viscera, and to be rolled up § beyond the femoral arch. It is not so, in large femoral hernia of long standing. This cellular

* Mesial. † Sacrad of. ‡ Peripherad of.

§ Atlantad.

sheath very frequently is loaded with fat, and in fat persons resembles the omentum (*e*).

Below * this cellular sheath, which is more or less dense, and distendible in proportion to the size and duration of the femoral hernia, the true

(*e*) This cellular sheath was first described, in this country, by Mr. Astley Cooper, and he has called it the *Fascia propria* of femoral hernia. I shall add Mr. Cooper's account of it. "A thin fascia naturally covers the opening through which the "hernia passes, and descends on the posterior part of the pubis. "When the hernia therefore enters the sheath, it pushes this "fascia before it, so that the sac may be perfectly drawn from "its inner side, and the fascia which covers it is left distinct." "If a large hernia is examined, this fascia is only found to "proceed upwards, as far as the edge of the orifice on the in-"ner side of the crural sheath, by which the hernia descends, "but in a small hernia, it passes into the abdomen as far as "the peritoneum, and forms a pouch, from which the hernial "sac may be withdrawn, leaving this, forming a complete bag "over the hernia. In a small hernia, the fascia is thicker than "the sac itself, but by being gradually extended, it becomes "thinner and less distinct; and in one example of this kind "from the female subject, this and the superficial fascia have "coalesced into one. I first observed this fascia in dissecting a "male subject, brought into St. Thomas' Hospital in the year "1800." "When this fascia is divided, a quantity of adipose "membrane is found between it and the sac, and when this is "cut through, the peritoneal sac itself is exposed." *Anatomy and Surgical treatment of Crural and Umbilical Hernia*, p. 6 & 7.—T.

* Centrad of.

hernial sac appears *(f)* formed, properly speaking, by the peritoneum, the thickness of which does not exceed, in most cases, that of the natural thickness of the peritoneum within the abdominal cavity, even although the femoral hernia be large and of long standing, except in those cases in which the viscera have contracted adhesions to the sac. In general, it may be said of femoral hernia, that of whatever size, and of however long standing it may be, it is never, in similar circumstances, included within so large and so compact a covering, as that of the inguinal and scrotal hernia. Because the femoral hernia has not the musculo-aponeurotic sheath of the cremaster muscle, and because the cellular substance accompanying the hernial sac, and interposed, in femoral hernia, between the proper hernial sac and the aponeurosis of the fascia-lata, is never so dense and compact as that which surrounds the hernial sac, and the spermatic cord, in inguinal and scrotal hernia. Indeed, every well informed and cautious surgeon, redoubles his attention and care in making the incision when he is obliged to operate on a femoral hernia; since experience has taught him, that the viscera are constantly found at a less depth in femoral than in inguinal hernia. And the surgeon would expose his pa-

(f) Pl. X. g. g.

tient to great danger, who, following the directions of Louis, proposed to open the femoral hernia with two strokes of the bistoury, the one through the integuments, the other into the hernial sac. This great difference of depth between femoral and scrotal hernia, has been attributed by the greater number of surgeons, to the greater density which the hernial sac acquires in the scrotal than in the femoral hernia; but this is absolutely false, and it is easy to demonstrate, that this lesser thickness and depth proceeds from the smaller number of external * coverings, which surround femoral hernia, in comparison with those surrounding scrotal hernia, the other circumstances above mentioned being similar. Finally, the peritoneum forming the sac of the femoral hernia, in its passage under † the crural arch, in the same manner as in the descent of the inguinal hernia, forms a neck (*g*), which after passing the fallopian ligament, inclines a little towards the ilium. The body and the bottom of the sac always assume an oval shape, and its greater axis always inclines in the direction of the bend of the thigh. The quantity of water contained in the sac of a femoral hernia, is almost never considerable, although it be of a large size, and strangulated for several days. Several conjectures have

* Peripheral. † Centrad of.

(*g*) Pl. X. a. g.

been made with regard to this circumstance, none of which appear to me sufficiently satisfactory. The explanation of this phenomenon, which in my opinion approaches nearest to the truth, is that deduced from the consideration of the size of the hernia, as it is always much smaller than scrotal hernia. And if it is true, that the secretion and accumulation of the serous fluid in hernia are in proportion to the size of the hernial sac, and the bulk of the viscera contained in it, this secretion and accumulation of lymph must necessarily be very small in femoral hernia, in comparison with that which takes place in inguinal and scrotal hernia. Indeed, we see in small inguinal hernia, that the quantity of water collected in the sac is very trifling.

§ 6. In the male subject, having divided transversely the aponeurosis of the fascia-lata close to the edge of the fallopian ligament, which causes, as I have mentioned above, the spontaneous elevation and opening of the femoral arch, we have then an opportunity of seeing and examining distinctly the proper and relative situation of the epigastric artery and spermatic cord in the cellular substance surrounding the neck of the hernial sac, and the relation of these vessels to the neck of the sac. The epigastric artery (*h*), arising from the

(*h*) Pl. X. 4.

internal iliac contiguous to the margin of the fallopian ligament, takes a direction slightly curved from below upwards*, and resting upon the outer† side of the neck of the hernial sac, it runs very deep-seated obliquely upwards‡ towards the *linea alba* (*i*); then §on the outside of the great sac of the peritoneum, it passes towards the rectus muscle(*k*), is hid behind‖ it, sending branches from below upwards¶ to meet with those sent downwards** by the *internal* mammary artery, with which they anastomose. The two small branches which this artery gives off, a little before it is crossed by the spermatic cord, and which are partly ramified on the cellular substance of the spermatic cord, and partly anastomose with the spermatic artery, are found in femoral hernia lying on the anterior†† surface of the neck of the sac, together with the spermatic cord, as may be seen in the pathological preparation preserved in this Museum. The contrary of this is observed in inguinal hernia, in which, for the reasons mentioned in another place, the spermatic cord and the small branches of the epigastric artery are found situated behind‡‡ the neck of the hernial sac.

* Atlantad and mesiad. † Lateral and dermal.

‡ Atlantad. § Peripherad of. ‖ Centrad of. ¶ Atlantad.

** Sacrad. †† Sternal aspect. ‡‡ Dorsad of.

(*i*) Pl. X. 5. 6. 7. (*k*) Idem. 6. 7.

§ 7. The spermatic artery (*l*), with the veins of the same name, descends along the iliacus internus and psoas muscles in an oblique line* from behind forwards, and approaches the superior† angle of the femoral arch; it then runs behind‡ the edge of the fallopian ligament, and from thence gradually ascends towards the inguinal ring (*m*), situated about an inch higher§ than the *internal*‖ and inferior¶ angle of the arch, and then descends into the groin and scrotum. In the passage of the spermatic artery, and accompanying veins, behind** the margin of the fallopian ligament, it passes over†† and crosses the epigastric artery, and intersects the top of the neck of the hernial sac on its anterior‡‡ surface. The vas deferens takes the same course in a retrograde direction; it ascends from the groin into the abdomen behind§§ the great peritoneal sac. After having passed the intersection of the spermatic artery towards the ilium, it leaves the spermatic vessels to descend into the pelvis behind‖‖ the urinary bladder. In the male, therefore, the neck of the femoral hernia is situated nearly in the middle, between the epigastric artery and the spermatic cord, which surrounds the top of the

(*l*) Pl. X. 9. (*m*) Idem, 11, 12.

* Sternad. † Atlantal. ‡ Centrad of.

§ More atlantad. ‖ Mesial. ¶ Sacral.

** Centrad of. †† Sternad of. ‡‡ Sternal aspect.

§§ Peripherad of. ‖‖ Dorsad of.

hernial sac, in the manner of a semi-circle, and advances the more forwards *, or towards the integuments †, the nearer it approaches to the inguinal ring; while on the other hand, the epigastric artery, from the place of the intersection of the spermatic cord, sinks into the cellular substance surrounding the neck of the sac, and after a certain space, bends towards the rectus muscle of the abdomen. In the annexed plate, the vessels forming the spermatic cord, are represented raised by a hook (*n*), to show clearly their course towards the inguinal ring, for if these vessels had not been elevated and supported artificially in the preparation, they would have remained covered by the inferior ‡ pillar of the aponeurosis of the external oblique. In spite of this displacement, any one will easily comprehend, that the vessels composing the spermatic cord, when left to themselves, would descend from the top of the neck of the hernial sac, and be placed immediately behind § the edge of the fallopian ligament.

§ 8. In speaking of the formation of inguinal hernia, I have remarked (*o*), that the great sac of the peritoneum, opposite to the inguinal region, is separated into two fossæ by the interposition of the umbilical ligament, and of the fold of perito-

* Sternad. † Dermad. ‡ Sacral. § Centrad of.

(*n*) Pl. X. 11. 15. (*o*) Memoir first, § 9.

neum which ascends at the side of the bladder, the one of which fossæ I call *superior* *, the other *inferior* †; and that it is in the *superior* ‡ where in general the beginning of the inguinal hernia is formed, which, in the form of a small thimble, makes its way out of the abdomen, under § the fleshy margin of the transverse muscle, in the same canal with the spermatic cord, before it crosses the epigastric artery. The femoral hernia likewise begins in this *superior* ‖ depression of the great sac of the peritoneum, with this difference, that instead of passing out closely applied to the spermatic cord, and following its course towards the inguinal ring, it makes its way through, a little below ¶ the cord, resting upon the great iliac vessels, along the inner ** side of which it appears outwardly †† in the bend of the thigh. And precisely from this circumstance, arises the difference which always exists between the position of the epigastric artery and the spermatic cord, relative to the neck of the hernial sac in inguinal and femoral hernia. Because in inguinal hernia, as the hernial sac lies over ‡‡ the spermatic cord, and as this cord, in its course from the side to the pubes, passes over §§ the epigastric artery, it follows, of course, that this artery and

* Atlantal. † Sacral. ‡ Atlantal. § Centrad of.
‖ Atlantal. ¶ Sacrad of. ** Mesial. †† Peripherad.
‡‡ Dermad of. §§ Dermad of.

the cord must be situated behind * the neck of the hernial sac. On the contrary, in femoral hernia, as the commencement of the formation of the hernial sac is below † the place of the passage of the spermatic cord, under ‡ the lower § margin of the transverse muscle, and consequently below ‖ the point of intersection of the cord and epigastric artery, it follows, of consequence, that the spermatic cord at the point where it crosses the epigastric artery, must be on the anterior surface ¶‖ of the neck of the sac of the femoral hernia, as may be seen in the annexed plate. Such in general are the origin and progress of femoral hernia. Sometimes, however, this hernia has its origin in the *inferior* ** fossa of the peritoneum, or between the pubes and the suspensory ligament of the bladder, under †† the inguinal canal, and from thence it passes obliquely towards the ilium, and on the inner ‡‡ side of the femoral vessels, with which it passes out §§ ; but I consider this case as very rare, and I have only met with it once, in the dead body of a woman affected with a very small hernia of this kind. The aponeuroses of the *internal* oblique, and of the transverse opposite to the *inferior* ‖‖ fossa of the perito-

* Dorsad of.	† More sacrad than.	‡ Centrad of.
§ Sacral.	‖ More sacrad than.	¶ Sternal aspect.
** Sacral.	†† Centrad of.	‡‡ Mesial.
§§ Peripherad.	‖‖ Sacral.	

neum, and near the insertion of these muscles into the pubes, resist much more the impulse of the viscera than opposite to the superior * fossa.

§ 9. Surgeons were not ignorant, even before the time of Arnaud, that the incision of the fallopian ligament, to free from strangulation the femoral hernia, in the male, was a very dangerous operation, from exposing the patient to an irreparable and fatal effusion of blood into the cavity of the abdomen. But although they knew from experience, that this severe accident was much more frequent in the male than in the female, yet they were of opinion, that in both sexes, the cause of this accident was not to be ascribed to any other circumstance but the injury of the epigastric artery. Arnaud (*p*) was the first, who, as far as I know, excited doubts on this fact, and was engaged in fixing the attention of surgeons on this important point of pathology, by pointing out that in the male the spermatic cord, passing over † the neck of the hernial sac in a semicircular manner, and running immediately behind ‡ the margin of the fallopian ligament, was much more exposed to be injured in the operation for femoral hernia, than the epigastric artery in either sex. This interesting reflexion had been

* Atlantal. † Dermad of. ‡ Centrad of.

(*p*) Mémoires de chirurg. T. 1. pag. 758.

occasioned by the observation carefully made by Arnaud, in the body of a man twenty two years of age, who had died a few minutes after the operation for incarcerated femoral hernia, in whom it was found, that it was not the epigastric artery which had been divided, but the artery of the spermatic cord. Garengeot (*q*) published this fact of practical surgery, in the second edition of his *Splancnologie*. Notwithstanding this, several of the most celebrated surgeons of those times doubted the accuracy of this observation, to whom Arnaud only answered, by exciting them to make the experiment on the dead body. These experiments in fact will show (*r*), that in the male subject, whether there be a femoral hernia or not, the incision of the fallopian ligament, as is usually practised in the female for removing the strangulation of the femoral hernia, can never be performed in the male without wounding the spermatic cord, and consequently, the spermatic artery. And indeed, as it is a certain and demonstrated fact, as I have explained above, that the femoral hernia, both in the male and female, forms at the *internal* and inferior * angle of the femoral arch, between the great crural vessels and the pubes, and that the spermatic cord runs on the anterior surface † of the upper ‡

(*q*) Vid. vol. II. pag. 5. (*r*) Loc. cit.

* Mesial and sacral. † Dermal aspect. ‡ Atlantal

part of the neck of the hernial sac, which it crosses, it follows of consequence, that the edge of the fallopian ligament cannot be divided a little upwards *, along with the neck of the hernial sac, without the artery of the spermatic cord being divided at the same time, whatever direction the surgeon may give to the cutting instrument. For, if the incision is directed vertically upwards† (*s*), or towards the place where the spermatic cord intersects the epigastric artery, both arteries will be included in the incision; if, on the other hand, the incision is inclined obliquely towards the pubes(*t*), the surgeon indeed may avoid wounding the epigastric artery, but undoubtedly divides the spermatic artery; lastly, if the incision is carried outwards‡ towards the iliac region (*u*), both these arteries, as in the first case, will be injured, or without doubt the epigastric artery. And even supposing that the femoral hernia has been formed immediately over§ the large femoral vessels, or between these vessels and the ilium, which I consider as a very rare case, so that the epigastric artery is found out of the direction of the incision inclined towards the ilium(*x*), the division of the fallopian ligament directly upwards‖ will include the spermatic ar-

* Atlantad. † Atlantad. ‡ Laterad.

§ Dermad. ‖ Atlantad.

(*s*) Plate X. 12. 11. 5. (*t*) Id. 12. 15.

(*u*) Id. 12. 10. (*x*) Id. 12, 13.

tery, and if obliquely towards the ilium, the abdominal artery(*y*). On which account, after a complete examination, there is in reality only one space (*z*), and that very short and limited, where the artery of the spermatic cord is less near to the margin of the fallopian ligament, than any where else; and this space is contiguous to the insertion of the femoral arch into the top of the pubes. For the inguinal ring, being situated higher than the *internal* and inferior* angle of the femoral arch, the spermatic cord, which runs close to the edge of the fallopian ligament, when it has reached the vicinity of the inferior and *internal*† angle of the femoral arch, necessarily leaves the direction from ‡ above downwards, and proceeds upwards § towards the seat of the ring where it prepares to pass out || into the groin. But if we reflect that this separation of the cord from the edge of the ligament is for a short space, the incision prolonged beyond a few lines directly upwards ¶ would never, or very rarely, protect the spermatic cord from being wounded.

§ 10. Günz wrote (*a*), that he had remarked in the dead body, that the spermatic artery is at

(*y*) Pl. X. 8.
(*z*) Id. 18. 15.
* Mesial and sacral.
† Sacral and mesial.
‡ The atlantal to the sacral aspect.
§ Atlantad.
|| Peripherad.
¶ Atlantad.

(*a*) *Libellus de hern.* pag. 78. Sed novi, qui in herniæ cruralis curatione medentes docebant, etiam a vasorum spermati-

so considerable a distance from the place where the incision is usually made for freeing the incarcerated femoral hernia, that unless the surgeon were to divide the fallopian ligament completely, and to prolong the incision upwards* farther than is necessary, this artery would never be exposed to injury. This might be said in some measure with regard to the epigastric artery; but with regard to the spermatic, I have not the smallest doubt in asserting, that Günz, in the examination of the dead body, did not employ all that accuracy which is requisite for ascertaining the true and natural situation of the spermatic cord, in relation to the margin of the femoral arch. For, in all the dead bodies in which I have made such sort of examinations, I have constantly found, that in order to include the spermatic cord in the incision, it is not at all necessary to make a great cut in the fallopian ligament directly upwards†, but that it is sufficient to make a simple division only for the space of two or three lines, at the part where the operation for incarcerated femoral hernia is usually performed in the female. I am also of opinion, that in large and old femoral hernia, the distance of the spermatic cord is still

corum læsione cavere sibi debere. Quare, ut quam justus hic metus sit, invenirem, in hæc quoque vasa, quanta potui diligentia inquisivi. Inveni autem ea tantum a loco plagæ distare, ut nisi quis hanc per totum ligamentum fallopianum, et ultra proferret, lædi non possint.

* Atlantad. † Atlantad.

less than three lines from the margin of the fallopian ligament, on account of the raising up and convexity which the swelling of the neck of the hernial sac produces in these large and old herniæ, which has a constant tendency to force the ligament upwards*, and to bring it nearer to the spermatic cord. There can also be no doubt, that likewise, in the experiments of this kind made on the dead body by the experienced surgeons, Verdier, Ruffel, Bassevel, Boudou, in which, according to the account of Arnaud(*b*), the incision of the fallopian ligament had been made with the same caution and with the same precision with which it is performed in the female for freeing the femoral hernia from strangulation, the spermatic artery has always been found included in the incision. And if the wounding of this artery is inevitable in the male subject not affected with hernia, there cannot be the smallest doubt, in the present state of our knowledge with regard to the pathology of this disease, that this would take place likewise in the operation of the incarcerated femoral hernia in the living subject, and perhaps more readily than in the dead body, and from an incision extended less upwards †, on account, as has been said, of the smaller distance of the spermatic artery from the edge of the fallopian

* Atlantad.

† Atlantad.

(*b*) Loc. cit.

ligament, in persons affected with hernia. Indeed, a perpendicular incision of two lines in the edge of the ligament might sometimes be sufficient to remove the strangulation without wounding the spermatic artery; but it is not easy to forsee in what cases a small incision of the ligament is sufficient to take off the strangulation; nor do I suppose that any surgeon, however expert and skilful he may be in the use of the knife, will dare in every case to engage to divide the fallopian ligament neither more nor less than two lines in depth.

§ 11. As it is therefore very evident, that, in the male, the femoral hernia cannot be freed from strangulation by means of an incision of the neck of the sac along with the fallopian ligament directly upwards, which exceeds two lines in depth, whatever direction may be given to the incision, without exposing the patient to the danger of a fatal hemorrhage, it follows, of course, that there can only be two modes to be employed in similar perplexing circumstances, that is, to weaken as much as possible the rigidity and resistance of the femoral arch, and then to substitute, instead of the incision, the gradual distention of the neck of the hernial sac, and of the femoral arch, immediately above* the place of the strangulation. The other

* Atlantad of.

mode is to give to the incision a direction different from that which is practised in women, and such as to avoid wounding the spermatic artery. For, with regard to the proposed ligature of the spermatic cord, before the division of what causes the strangulation, and the ligature, after it, of the epigastric artery, these are chimerical projects, which will never be realized in practice; in the first case, on account of the loss of the testicle; and in the second, on account of the difficulties depending upon the depth of the situation, upon the imperfection of the instruments proposed for this purpose, and especially, because after the division of the spermatic or epigastric artery, the effusion of blood into the abdomen takes place secretly, so that on the first appearance of certain marks of this accident, the life of the patient cannot be saved, even although the surgeon, after many cuts, were to succeed in tying the one or other, or both of these arteries.

§ 12. I have demonstrated above how much the aponeurotic web of the fascia-lata adds to the strength and resistance of the femoral arch, and that passing over* the fallopian ligament, it is firmly attached to its edge, and keeps it tense downwards† opposite to the pelvis; and I have expressly mentioned, that not only in the living but

* Dermad of.

† Sacrad and dorsad.

even in the dead subject, on dividing this aponeurotic fascia close to the margin of the fallopian ligament, the femoral arch is evidently raised and opened by its proper elasticity. Very frequently, in the act of performing the operation for strangulated hernia in the female, I have perceived that the aponeurotic web of the fascia-lata had a great share in producing the strangulation of the protruded viscera; for on dividing this aponeurosis, even before laying bare the viscera, I found that the femoral arch no longer pressed so strongly upon the parts protruded in the hernia. I have been still more convinced of the truth of this fact, on reading that the same thing had been remarked by Günz, Bertrandi and Richter (*c*). Therefore, I am of opinion, that one of the principal precepts to be put in practice, for the quick and safe performance of this operation, both in the female as well as in the male, is that the incision of the integuments be made contiguous, and parallel to the edge of the fallopian ligament, and that it be prolonged to such an extent from the ilium to the pubes, that

(*c*) Traité des hernies, pag. 248. Les fibres aponeurotiques de l'aponéurose fascia-lata, qui s'implantent dans le ligament de Poupart, paroissent quelquefois être la seule cause de l'étranglement, en tirant le ligament en bas. Du moins a-t-on vu l'étranglement cesser sur-le-champ après la section de ces fibres.

on separating the integuments, the aponeurosis of the fascia-lata may be divided exactly, and to an equal extent, along the edge of the fallopian ligament, corresponding accurately to the degree of the strangulation. This is the more easily executed from the oval shape of the hernia, and its situation corresponding to the bend of the thigh, obliging, to use the expression, the surgeon to make the first incision of the integuments in a line parallel to the fallopian ligament, and in no other way. Under the aponeurosis of the fascia-lata, an oval fatty body presents itself, which on being slightly moved, may be insulated from the contiguous parts, and which, in fat persons, resembles a portion of omentum, having precisely the same shape and size as the hernia; so that most young practitioners stop and hesitate whether they have opened the hernial sac or not, and whether the hernia is really omental. But if the disease is actually formed by the descent of intestine, on pressing gently this fatty tumor, a certain resistance and elasticity is felt, which is not proper to the fat, and on observing very carefully this fatty capsule, it is clearly perceived, that it has not the peculiar structure of the omentum. Therefore, on laying hold of it with the point of a pair of forceps, and dividing layer by layer, the hernial sac at last appears under this fatty capsule, distinguished from it by its smooth

texture, and by its transparency. This is one of the most delicate parts of the operation of femoral hernia in both sexes, and more particularly so, because, in general, the hernia, on being stripped of its coverings, is of a small size, sometimes very small, so that it requires on the part of the surgeon unusual information, and likewise great dexterity and slight of hand to separate this fatty sheath from the true hernial sac, without dividing the sac, and without wounding the viscera contained in it. And with this intention, I cannot sufficiently recommend to young surgeons, to profit by every opportunity which may occur of performing this operation on the dead body of either sex, in order to acquire the habit of knowing quickly, and of overcoming this difficulty, which is much greater than it has been estimated by surgeons in general. Having opened the hernial sac in the same direction, parallel to the femoral ligament, and the viscera being laid bare, if a gentle pressure is not sufficient to replace the protruded parts, which are in general of very small bulk, the prudent and skilful surgeon will cautiously introduce, between the protruded viscera and the neck of the hernial sac, a fine blunt pointed director, so far as to penetrate into the abdomen, to show the easiest direction in which the parts that have descended may be replaced. Following the course pointed out by the director, the surgeon will in-

troduce the point of Arnaud's (*d*) hook within the femoral arch, by means of which he will raise it up with one hand, while with the other, he will gently return the protruded viscera. But if the femoral arch, although no longer held down by the aponeurosis of the fascia-lata, does not yield sufficiently to the elevation, on account of its exceeding thickness and rigidity, the surgeon, without however removing from its place the point of Arnaud's *elevator* already introduced, will make, with his hand unsupported, four or five scratches perpendicularly on the edge of the fallopian ligament, at a little distance from each other, and of such a depth, as not to pass through the thickness of the ligament, but merely to weaken and relax it, that it may yield to that degree of elevation, or of dilatation, which is required to complete the operation. And it is a fact, that these scratches are immediately converted into as many furrows, which diminish the thickness and tension of the femoral ligament, without any risk of wounding the parts lying under * it.

§ 13. Bell (*e*) proposes to make only one of these incisions into the substance of the fallopian ligament, nearly in the manner above pointed out,

(*d*) Mémoires de Chirurg.—A strong hook, the curved part of which is flat, with an obtuse point.—*T.*

* Centrad of.

(*e*) A System of Surgery, T. v. page 362.

before proceeding to the elevation of the femoral arch, by means of Arnaud's hook; and he directed that this incision should be deepened by repeated cuts, until there only remained of the whole substance and thickness of the ligament a very thin layer, sufficient to prevent the injury of the subjacent spermatic vessels. I have no doubt, that an operator much skilled in minute anatomical researches, and accustomed to dissect with his hand free and unsupported, might do that without wounding the spermatic cord, especially if he proposes to make this incision at the *internal* and inferior * angle of the femoral arch (*f*), a little before the insertion of the fallopian ligament into the top of the pubes, where, as I have pointed out, the spermatic artery is more distant from the margin of the femoral arch, than at any other part. But it is proper to observe, that, in proposing to leave only a very thin layer of the ligament undivided, it is very different operating on the dead body and in the living subject, upon parts deeply seated and covered with blood; that besides, so great a steadiness of hand is possessed by few surgeons, and experience shows, that the repeated scratches already mentioned are much less difficult to perform, and less dangerous, than the single incision, to obtain the end of weaken-

* Mesial and sacral.

(*f*) Plate X. 18. 14.

ing the femoral arch, as much as is sufficient to allow the replacement of the viscera. And I do not speak of this theoretically, or from the inspection of the dead subject only, but in consequence of my own observations made on the living body. For, after having practised the scarifications successfully in several cases of strangulated femoral hernia in the male, I have also employed them in a much greater number of incarcerated femoral herniæ in the female, and I have always obtained favourable results from this mode, whenever the fallopian ligament opposed a strong resistance to its elevation. And I have remarked, that whenever this practice is necessary, it is proper that the scarifications should be made principally in the margin of the ligament thickened by the firm union of the aponeurosis of the fascia-lata, as it is this thick and hard margin which opposes the greatest resistance to the elevation of the whole arch, and to the replacement of the viscera. On which account, before making these superficial incisions, it will always be a very good precaution on the part of the surgeon, to introduce first the smooth point of Arnaud's hook, and to raise up the fallopian ligament with it, at least so far as to present, as well as possible, its thickened and rigid margin to the eye of the operator, or to the edge of the knife.

§ 14. Another very useful mode of raising and dilating the femoral arch, is that practised by

means of the instrument called Leblanc's *dilator* (*g*). The numerous instances of success obtained by that author, and several other celebrated surgeons, especially by Hoin, do not leave any room to doubt the advantages which may be derived from the use of this instrument. With regard to the propriety of the one or other of these two means, that is, of Arnaud's hook, or Leblanc's *dilator*, it is proper to observe, that whenever the immediate cause of the strangulation is seated in the fallopian ligament, Arnaud's hook alone, or along with the scarifications above mentioned, will be sufficient to obtain the purpose, and will be preferable to Leblanc's *dilator*, on account of the simplicity of its construction, its easy application, and likewise, because it serves to raise the margin of the femoral arch, without any risk of bruising or compressing the protruded viscera in any way. On the contrary, when there is reason to suspect, that the immediate cause of the strangulation, depends principally upon the constriction of the neck of the hernial sac (*h*), Leblanc's *dilator*

(*g*) Précis de chirurg. T. II.

(*h*) Mauchart, De Hern. incarcerata. Hujus rei evidens hoc esto specimen. Lutetiæ Parisiorum, in nosocomio *Hotel-Dieu* dicto, virum hernia crurali mortuum, qui operationem vivus noluit admittere, aperiendo, saccum hernialem sub et a ligamento Vesalii strangulatum deprehendi. Dissecto illo ligamento, saccus ipse superius, quasi loro constrictus, ut digitum auri-

will deserve the preference over Arnand's hook; because the two wings of the *dilator* stretching the neck of the hernial sac in opposite directions, dilate it equally at every point of its circumference, while they contribute at the same time, to raise the femoral arch. There will be reason to suspect, that the strangulation depends principally on the neck of the sac, if we take into consideration the circumstances which I have already mentioned (*i*), and if we observe, that the passage of the director between the viscera and the neck of the sac is unusually difficult. In this case, the slender point of Leblanc's instrument should be gently introduced between the viscera and the neck of the sac; and it must be gradually passed into the cavity of the abdomen as far as possible; then by separating its wings, the neck of the sac is to be dilated, and the femoral arch raised so much as to take away the

cularem, extracto intestino, vix ingerere licuerit, inferius seu in fundo amplior, partem intestini ilei continebat. Repositus hic saccus integer cum intestino suo contento, non apertus in ipso quoque abdominis cavo suum strangulavisset intestinum.

(*i*) Leblanc loc. cit. Ces parties découvertes j'introduisis l'extremité du dilatatoire dans l'issue qui étoit fort serrée; l'ayant ensuite introduite plus avant et par degrés, je dilatai en levant en meme tems l'arcade vers le haut, et les parties rentrèrent. En élevant un peu vers le haut, avec la portion arrondie du dilatatoire, la partie la plus étroite de cette bande, et en pressant un peu sur les cotés, on aggrandit suffisamment cette ouverture pour y faire rentrer les parties sorties.

constriction, and to allow the viscera to return into the abdomen, under the concavity of the instrument. Hoin (*k*) asserts, that the dilatation of the neck of the hernial sac being properly made with this instrument, so that the membranous tube, to use the expression, is weakened, it is not at all necessary to keep the instrument forcibly in its position, until the viscera are returned, but that, after a suitable dilatation is made, the instrument may be withdrawn, to allow the viscera to be pushed up * into the abdomen; in doing which, he says, that no obstruction is met with.

§ 15. If unfortunately, the intestine is found firmly attached to the hernial sac on either side, or, as more commonly happens, on its posterior surface †, by that kind of adhesion which is called *fleshy*, and which connot be separated by the knife without injuring the intestine, or exposing the patient to other accidents equally formidable, it may be practicable, however, to introduce Leblanc's instrument between the viscera and the neck of the hernial sac. After making a large dilatation with this instrument, and after having replaced that portion of the loop of intes-

(*k*) Leblanc loc cit. pag. 63. J'essaie de repousser doucement l'intestin; il ne peut pas rentrer. J'introduis votre *dilatatoire*, j'en ecarte avec ménagement les branches, je le retire; ensuite je fais rentrer fort facilement dans le ventre l'anse d'intestin.

* Atlantad. † Dorsal aspect.

tine, which is found free and susceptible of being returned into the abdomen, (as the weakening induced in the neck of the sac, and in the femoral arch, by the *dilator*, has removed the immediate cause of the strangulation,) the surgeon will content himself with bringing together the lips of the hernial sac and of the wound, and will cover them in the manner pointed out, in speaking of this complication (*l*); and he will take care to keep the dressings moistened day and night with the decoction of mallows. For experience has shown, that on the removal of the proximate cause of the strangulation, by means of an ample dilatation, nature, ever provident, very often draws back the point of adhesion of the intestine with the hernial sac, and by a wonderful process, makes it gradually re-enter into the abdomen ; or, if this is not absolutely possible, it makes the surface of the loop of intestine remaining on the outside * exfoliate, covers it with granulations, and at last incloses it in a common cicatrix with the integuments.

§ 16. But in the case of strangulation occasioned by the neck of the hernial sac, complicated with adhesion of the intestine, to the posterior surface † of its neck, on account of which it is impossible to employ Leblanc's *dilator* without

(*l*) Memoir second, § 29.

* Peripherad. † Dorsal portion.

bruizing the viscera, is it demonstrated, that it is not possible to give to the incision a direction different from that which is practised in the female, and in such a manner, that the neck of the hernial sac may be divided through its whole length, without wounding the epigastric or spermatic arteries? I have examined all this subject attentively, in the body of the man affected with hernia, from which I have taken the annexed plate, in which these blood vessels had been previously injected and left in their natural situation, and I found that the incision of the neck of the hernial sac, even in the male, may be made with impunity and successfully, by giving a quite opposite direction to the incision to that which is practised in the female. Having opened the hernial sac and drawn it outwards, as much as is sufficient to allow a fine grooved director to pass with safety between the intestine and the neck of the hernial sac, the groove of the director is to be turned downwards† towards the *internal* and inferior‡ angle of the femoral arch, and a little opposite to the attachment of the fallopian ligament to the os pubis; then we pass along this a probe-pointed bistoury with the cutting edge downwards‡, and turned a little towards the attachment of the ligament to the pubes, by means of which, the neck of the sac is to be divided through

* Sacrad. † Mesial and sacral. ‡ Sacrad.

its whole length, at its internal and inferior* part, along with the fallopian ligament, in the vicinity of its insertion into the top of the pubes. By giving this direction to the incision of the strangulated femoral hernia in the male, we avoid the two arteries above mentioned (*m*); for the epigastric is situated at the opposite side of the neck of the sac, and the spermatic is found above† the place of the incision, or upon the upper‡ part and anterior surface§ of the neck of the hernial sac, which artery therefore cannot be included in the incision from above downwards‖, as it constantly is in the ordinary way from¶ below upwards. And the spermatic cord is the less exposed to injury in the first case; as at the *internal* and inferior** angle of the femoral arch, the cord rises and retires from the margin of the fallopian ligament, where it is inserted into the upper†† part of the pubes (*n*). And the whole length of the neck of the hernial sac is not only divided by this inci-

* Mesial and sacral aspect. † Atlantad of. ‡ Atlantal.

§ Dermal aspect. ‖ The atlantal to the sacral aspect.

¶ The sacral aspect to the atlantal. ** Mesial and sacral.

†† Atlantal.

(*m*) These arteries are avoided, it is true, but the author either forgets, or is not aware, that the obturator artery sometimes runs round the neck of the sac, and would be here in the way of the knife. *See Dr. Barclay's Description of the Arteries,* p. 237. *Also Mr. A. Cooper, Part II. Chap. VI. Plate VIII.*—T.

(*n*) Plate X. 18. 14.

sion, but the fallop an ligament is also partly detached from its insertion into the pubes, which must contribute greatly to relax the femoral arch, and therefore remove completely every obstacle to the replacement of the viscera when free from adhesion to the hernial sac.

I have very frequently repeated the following experiment on the dead body of men not affected with hernia: Having introduced a director within the femoral arch, on the inner* side of the iliac vessels, and turned the groove downwards†, and a little towards the insertion of the ligament into the pubes, I have cut the insertion of this ligament obliquely downwards for two or three lines in depth, and I have observed, that on doing this, the femoral arch is considerably relaxed, without the spermatic cord being wounded, which is situated higher‡, supported and defended by the convexity of the director and the back of the knife. I performed the same experiment on the body of a man who died in consequence of a gangrened femoral hernia, and after making the incision in the manner above mentioned, I observed, that there was the same security also in the hernial patient of not wounding the spermatic artery, while the neck of the sac was completely divided, and the femoral arch greatly relaxed. These facts have so fully convinced me of the utility and safety of this incision, that I would not hesitate a moment to say, that this is

* Mesial. † Sacrad. ‡ More atlantad.

the general rule to be followed in every case of strangulated femoral hernia in the male, if I did not still entertain some doubt that the detaching of the femoral ligament, even for a few lines, from its insertion into the pubes, might more readily give occasion to a return of the hernia, than the raising it up by means of Arnaud's hook, or the dilatation by means of Leblanc's instrument. On which account, until farther experience elucidates this point of practical surgery, I will restrict myself to say, that whenever, from the appearance of the circumstances relating to the immediate cause of the strangulation, and from the facility of introducing the probe between the viscera and the neck of the sac, it shall appear that the usual means of dilatation may be sufficient for the replacement of the viscera, they ought to be preferred. In an opposite case, we ought to proceed without hesitation to the incision of the neck of the sac, and of the fallopian ligament, in the manner above explained, as the mode which offers the double advantage of freeing the viscera from strangulation, and guarding the patient from mortal hemorrhage.

§ 17. Arnaud met with a case of femoral hernia in a woman, in which the intestine was found strongly strangulated by the neck of the hernial sac, and at the same time adhering all round to the neck of the sac, on which account he found it

impossible either to introduce the probe between the viscera and the sac, or to replace the intestine and free it from the immediate cause of incarceration, after raising the femoral arch, by passing the hook between the neck of the sac and the fallopian ligament (*p*). In this state of the case, this eminent practitioner adopted a bold practice, but the only plan which he had in his power, viz. to divide the protruded loop of intestine, to carry the grooved conductor within the intestine, and on it to divide the narrow neck of the hernial sac, and the femoral arch, along with the superior* parietes of the intestine, which immediately allowed the feculent matter to be discharged by the wound, and caused the symptoms of strangulation to cease, with the best possible success. This operation may undoubtedly be performed in the female without fear of fatal hemorrhage. But, if a similar complication unfortunately presented itself in the male, since in the latter the incision upwards† is not practicable on account of the certain injury of the spermatic cord, there can be no doubt, that in the event of the absence of any other remedy, it would be necessary to abandon the patient to his melancholy fate. But since, as I have shown, by giving a contrary direction to the incision of the neck of

(*p*) Dissertation on Herniæ.

* More atlantal. † Atlantad.

the sac to that which is performed in the female, it is proved, that it is possible to avoid wounding the spermatic cord, and consequently a fatal hemorrhage; therefore, even in the male, on the occurrence of this dangerous case of *fleshy* adhesion of the intestine, all around the neck of the sac, complicated with firm strangulation produced principally by the neck of the sac, following the example of Arnaud, the surgeon having divided the intestine contiguous to the arch, and introduced the grooved sound within the intestine, turning the groove towards the inner and inferior * side, will then divide the internal and inferior † parietes of the intestine, together with the neck of the hernial sac, and will direct the rest of the incision towards the *internal* and inferior ‡ angle of the femoral arch, or towards the insertion of the fallopian ligament, into the upper part of the os pubis. This operation, being free from the danger of fatal hemorrhage, will produce the same good effects in the male, in similar circumstances, as Arnaud obtained in the female.

§ 18. The course which the spermatic cord takes in the male along the margin of the fallopian ligament, from the superior and anterior spine of the ilium to the inguinal ring, is occupied in

* Mesial and sacral.

† Mesial and Sacral.

‡ Mesial and sacral.

the female by the *round* ligament of the womb, with this difference, that in the female, the inguinal ring being situated lower than in the male, the *round* ligament of the womb, before passing out of the ring, retires less from the *internal* and inferior * angle of the femoral arch, than the spermatic cord. Farther, the *round* ligament of the uterus in the female, as the spermatic cord in the male, passes over † and intersects the epigastric artery, before it reaches the inguinal ring. And since in both sexes, the femoral hernia makes its appearance at the *internal* and inferior ‡ angle of the femoral arch, so both in the male and in the female, the epigastric artery remains in its place at the outer side § of the neck of the hernial sac; and the *round* ligament of the uterus, in the same manner as the spermatic cord, runs on the upper part and anterior surface ‖ of the neck of the sac. On which account, in a case of strangulated femoral hernia in the female, the surgeon, by directing the incision of the neck of the hernial sac, and of the femoral arch upwards ¶ towards the *linea alba*, avoids certainly the wounding the epigastric artery, but never that of the *round* ligament of the uterus; on the contrary, he always entirely or partially divides it. But he has no reason to fear, from

* Mesial and sacral. † Dermad. ‡ Mesial and sacral.

§ Lateral aspect. ‖ Atlantal and dermal aspect.

¶ Atlantad.

that accident, a fatal effusion of blood into the cavity of the abdomen, because the arteries of the *round* ligament of the womb are very small in women not pregnant, and not in the puerperal state, and they are still more contracted and almost obliterated in women advanced in life, and absolutely of a capillary size, where the round ligament approaches the inguinal ring. From this fact, it will no longer be a problem of difficult solution for any learned surgeon, why, in the femoral hernia strangulated by the neck of the hernial sac, in the female, there are so numerous and frequent cases of success of the division of the neck of the sac, and of the femoral arch directly upwards *, while we cannot mention a single example of successful issue of a similar division practised in the male, although, in this way, the wounding of the epigastric artery has been avoided in both sexes.

§ 19. It appears to me, from repeated observations, that the femoral hernia is more liable to return than the inguinal. It is a certain fact, that in the femoral hernia, contrary to what takes place in the inguinal, the return of the disease always produces a tumor, which in a short time acquires a larger size than it had at first, and as broad at its upper † part and neck, as at its base situated transversely in the bend of the thigh; which in-

* Atlantad. † Atlantal.

creases the difficulty of retaining the parts in their place. On this account, the prudent precaution of making all those patients wear a truss, who have undergone the operation for hernia, ought never to be neglected, and more particularly after the cure of the incarcerated femoral hernia. The truss most proper for retaining, as well as for preventing the return of this hernia, is not much different from that which is employed for inguinal hernia. And it is precisely in the femoral, still more than in the inguinal hernia, that the advantage of the circular spring is rendered evident, one of the extremities of which rests upon the tensor vaginæ femoris, the other on the femoral arch in the bend of the thigh of the opposite side. In the elastic truss for femoral hernia, no advantage can be derived from the leather thigh-strap, on account of the great obliquity of the descent of the strap, from the sound flank to the point of pressure; from which it follows, that it rather tends to make the bandage rise up than to keep it in its proper position. And this inconvenience renders the semicircular spring of little or no use, because, from having the point of support on the spine, it requires to be retained by the strap. On the contrary, the spring of the length suggested by Camper, forms of itself a fixed point, independent of the strap, therefore its lever being free (*q*), presses constantly on the femoral arch.

(*q*) Memoir first, outline, p. 107. 2 A.

The truss for femoral hernia, although in general it be similar to that for the inguinal, requires, however, some modifications corresponding to the form of the parts upon which it ought to be applied. And, in the first place, the neck of this truss ought to be shorter than that which is employed for inguinal hernia, in so far as the seat of the femoral hernia is nearer to the ilium than the inguinal ring. In the second place, the direction of the neck of the truss ought to be in an oblique line from the ilium to the pubes, precisely corresponding to the course of the femoral arch. In the third place, the pad should be of a length proportioned to that of the neck of the hernia, and of such a breadth, from * above downwards, so as not to exceed the bend of the thigh, as otherwise it would impede the motion of flexion of the thigh, and in bending the thigh, the truss would be forced upwards †. The plate of the pad should be inclined, so as to compress the inferior ‡ margin of the abdomen, from § below upwards, without its inferior ‖ edge passing beyond ¶ the bend of the thigh.

* The atlantal to the sacral aspect. † Atlantad.

‡ Sacral. § The sacral towards the atlantal aspect.

‖ Sacral. ¶ Distad of.

MEMOIR FOURTH.

OF GANGRENED HERNIA; AND OF THE MEANS WHICH NATURE EMPLOYS FOR RE-ESTABLISHING THE CONTINUITY OF THE INTESTINAL CANAL.

§ 1. STRANGULATED hernia is very frequently attacked by gangrene, on account of the negligence and hesitation of the patients, but perhaps still more frequently owing to the improper, rough, and repeated handling of it by inexperienced surgeons, in order to obtain, in every species of incarceration, and at whatever expense, the speedy replacement of the protruded viscera (*a*). The

(*a*) This dangerous accident is more frequent in cases of femoral than of inguinal hernia. This circumstance, besides the reasons which I shall mention, is to be ascribed, in my opinion, to the improper mode commonly employed of directing the pressure on the protruded viscera, that is from below upwards, as is practised in inguinal hernia, whereas it ought to be made in a quite opposite direction, if we attend to the angle which

generality of surgeons do not recognise any difference between the *acute* and *chronic* incarceration, or to speak more correctly, the *quick* and the *slow*; therefore, they begin immediately after the accident, in the second as well as in the first case, to employ their whole exertions in handling and squeezing the viscera into the abdomen, when, on the contrary, in the *acute* strangulation in young and robust persons, they ought never to try the *taxis* before employing, carefully and for a proper time, those means which are calculated to allay the excess of general excitement and spasm, to relax the parts and dispose them to return, such

the protruded viscera make with the femoral arch, in this species of hernia. On which account, we ought to proceed in the following manner, in a case of strangulated femoral hernia: Having placed the patient on his back, with the thighs bent, and with the knee of the affected side turned a little inwards, in order to relax as much as possible the aponeurosis of the *fascia-lata*, the surgeon will gently press the femoral hernia with the point of his fingers from above downwards, as if he wished to make it pass into the thigh, rather than into the abdomen, and he will persist in this gentle pressure until he observes the tumor descend on a level and in a proper direction with the femoral arch, then, turning the points of the fingers from below upwards, he will press the viscera, cautiously and in the usual manner, under the femoral arch into the abdomen. To accomplish the first part of this operation, the surgeon will place himself with his back turned to the face of the patient; and to perform the second part, he will place himself opposite to him, or in the usual position.

as venesections, topical emollients, emollient glysters, and more especially, after blood-letting, the general warm bath. I have very frequently demonstrated, in this school of surgery, the utility of this practice in *acute* strangulations recently occurring in young and vigorous persons, and my pupils have repeatedly observed, that after venesection, and during the use of the general warm bath, or a little after, herniæ have returned as it were spontaneously, which had been previously handled by several surgeons without success. And if this precept relative to the treatment of recent *acute* strangulations in young and stout subjects were generally adopted by all professional persons, I am of opinion, that the operations for strangulated hernia would not be so frequent as they are, and that there would be a much smaller number of poor patients sent from the country, especially to an hospital, with gangrened hernia. And this doctrine is not new, as it was very well known in the time of Franco(*b*), who on that subject thus expressed himself: *Bien souvent tant plus le presse-t-on avec la main pour le réduire tant plus s'augmente l'inflammation et la douleur aux parties et au ventre——. Car puisque quelque peu rentre dedans, le reste le suit facilement sans le presser guéres, et quand on ne le peut réduire sans le molester par trop, faut user des bains ou fomentations.* This is

(*b*) Traité des hernies chap. v. pag. 25.

not the case in the *slow* strangulation of old and very large hernia in weak persons, or in persons advanced in life. In these cases, it is even of consequence to support the strength of the patient, and therefore bleedings, general tepid bath, or any other debilitating remedy, are hurtful, from inducing general want of tone, and accelerating the process of gangrene in the intestine, both during the state of incarceration, and after the replacement. And since experience shows, that, in the greater number of cases, these *slow* strangulations of old hernia are in a great measure occasioned by the excessive accumulation of feculent matter, or extraordinary evolution of air in the tumor, nothing has a better effect in dislodging the former, and diminishing the volume of the latter, than cold applications; by the action of these we see the scrotum become corrugated as well as the cremaster muscle, the increased action of which is sometimes alone sufficient to cause the return of the parts, and more effectually than the hands of even the most skilful surgeon. On this point, Petit mentions that he had seen one of these herniæ made to return by an empiric, by merely pouring a pail of cold water over it.

§ 2. But whether we treat of the *acute* or *slow* strangulation, surgery is still defective in precise and accurate rules, to enable us to determine, in individual cases of incarcerated hernia, to what

period the operation for hernia may be with safety deferred, and when it ought to be performed, immediately or soon after the incarceration. I have no doubt, however, that with the assistance of numerous observations carefully made and compared together, the art is likely to make considerable progress on this very important point of the treatment of hernia. In the mean time, I think it will be of advantage to relate here the facts which have occurred to me, with regard to the marks of the one or other case, which in the course of my practice have appeared to me the least fallacious, and to show that, in general, the operation is too long delayed; and this is the reason, in my opinion, why several of the greatest masters of the art are most unfortunate in the practice of this operation, while many other surgeons, very much inferior in learning and manual dexterity, but prompt in operating, almost always obtain favourable results.

In the first place, when the strangulation is so slow and moderate, that it intercepts the course of the feculent matters, but does not compress deeply the substance of the intestine, the hernia is swelled, but not painful, the abdomen is soft, and although distended, bears pressure. The patient complains of general restlessness, of belching of wind, of dryness of the tongue and fauces, and of loathing of the stomach, resembling nausea. After twenty four, or thirty hours have elapsed in

this state, vomiting comes on, dryness of skin, fever, with sometimes a hard and slow, sometimes a soft and frequent pulse. On the contrary, in young and robust persons, when the strangulation of the intestine, at its first appearance, is so violent as not only to intercept the course of the feculent matter, but likewise to compress deeply the substance of the intestine, and actually to strangulate it, vomiting and general anxiety arise almost at the very moment the strangulation of the bowel takes place, and the efforts of vomiting continue, although the stomach be quite empty. Farther, if the patients are young and stout, the hernia not only very soon becomes painful, but the whole abdomen also is sensible to the most gentle touch, an undoubted and dreadful mark, that there is a threatening of an attack of inflammation, or that it has already spread over the whole circumference of the peritoneum; hiccup begins, the pulse is hard, contracted, quick, with extreme depression of body and mind of the patient, the more marked if he was naturally lively and strong. Soon after, both in the *slow* and *acute* strangulation, when the loss of vitality of the strangulated intestine is about to supervene, or has already come on, the patient says that he feels relieved from the excessive pains which he felt in the hernia and in the abdomen, and from the continual tendency to vomiting, which had so much distressed him from the commencement of the disease.

But instead of these distressing symptoms, he is affected by others still more violent and formidable; such as hiccup more urgent than before, which is a fatal symptom, especially in old persons; a cold sweat over the whole surface of the body, so that the skin is less warm than that of a person who has recently expired. The pulse is small, irregular, tremulous, the countenance ghastly, the functions of the brain disturbed, the skin covering the hernia is tinged of a red colour, with livid streaks. This redness of the skin of the scrotum, conjoined with the preceding symptoms, constantly marks the near approach of sphacelus of the parts contained in hernia, and if the tumor yields on pressure, giving a feeling of crepitation, the sphacelus of the protruded parts is already complete. I am aware, that the intestine is found sometimes livid and black, although the symptoms of strangulation have been *slow*, and the operation performed in very good time. I could adduce several such facts; but whenever I have examined the subject attentively, in similar circumstances, I have found that this livid and blackish colour of the intestine was not produced by inflammation, and still less by gangrene, but was rather the effect of *sugillation*, which may take place although the intestine has not been deeply constricted, but merely compressed. This is demonstrated by the *sugillated* or *ecchymosed*, as it is called, and blackish intestine, preserving, nevertheless, its natural con-

sistence and globular shape, and aptitude to resume its functions, after being replaced in the abdomen, while that which is deprived of vitality, gangrened, and approaching to sphacellation, besides exhaling a cadaverous fetor on the first opening of the hernial sac, is likewise depressed, flaccid, and the slightest touch of the fingers of the operator strips it of its external coat, as it is black and hard, or as some call it *hepatised;* in which circumstances, it is no longer in a state to be replaced. These unfortunate circumstances ought not however to be considered as contra-indicating the operation; for if even the mortification of the intestine has begun, the operation would be always the only means of saving the patient, in so far as the division of the intestine facilitates the discharge of the feces, diminishes the painful tension of the abdomen, and promotes the separation of the gangrenous parts.

From the enumeration of the phenomena which this disease presents, it clearly appears, that *incarcerated* and *strangulated* hernia have a different signification, although both of these terms have been employed indiscriminately. For in *incarcerated* hernia, the course of the feces is interrupted, without any considerable injury of the texture and vitality of the intestine engaged in the hernia, while in the *strangulated*, besides the suspension of the natural course of the fecal matters, there is an organic injury of the coats of the in-

testine, with loss of vitality. This distinction is proved by practice : the intestine which has been simply *incarcerated*, recovers its action immediately after being replaced in the abdomen ; the *strangulated* intestine never recovers it. And in these cases, it is not the disorganisation, and the loss of vitality of the protruded portion of intestine, which accelerate principally the death of the patient ; but the state of violent distention, of greatly excited action, and consequently of inflammation and gangrene, of that part of the intestinal canal contained in the abdomen corresponding with the stomach. In fact, on opening the body of those who die of this disease, there appears, as the first layer, some bowels enormously distended with flatus and liquid matters, which bowels, greatly enlarged in diameter, reddish or purple coloured, covered with coagulable lymph, seem to occupy the whole abdomen. Under these many others are found, but contracted, and little or not at all inflamed, except at the place contiguous to the strangulation. The great peritoneal sac is much less inflamed than the portion of intestine, the continuation of the stomach. The extreme distention, therefore, of this portion of intestinal canal, and the increased action excited in it, to free itself from the distending and irritating cause, are the principal causes of the acute pains which the patient feels in the whole circumference of the abdomen, and especially in the umbilical re-

gion, which are much greater than those occasioned by the portion of intestine strangulated in the hernia.

This state of violent irritation and increased action, always accompanied by great inflammation, and afterwards gangrene, is what, properly speaking, kills the patient, rather than the incarceration of the portion of intestine included in the hernia. I am of opinion, that if the rupture of the strangulated intestine in hernia occurred much more speedily than it commonly happens, and before that portion of the intestinal tube contained in the abdomen, the continuation of the stomach, were subjected to the enormous distention and excitement, such as is observed in the dead bodies of those who die of strangulated hernia, the event of this severe disease would not be, at least, either so quickly or so frequently fatal. Undoubtedly, when only one third of the circumference of the intestine in hernia is strangulated, so that the natural course of the feculent matters is not entirely interrupted, all the symptoms of strangulation are much milder than in the first case, and the patient is carried off very slowly. Nature makes very great efforts to reject by the mouth, what cannot be carried off by the rectum, in order to free the portion of intestinal tube in continuity with the stomach from that enormous degree of distention and irritation; but she can only effect this very imperfectly; and the retrograde action of the intestine increases the degree

of the excitement, and affects the nervous system in general. On which account, in similar circumstances, emetics and purgatives are equally injurious and useless.

§ 3. The least fatal consequence of this severe accident, is the discharge of the feces by the wound, or the *artificial anus;* a loathsome and troublesome disease indeed, but not however without hope of radical cure, in spite of the interruption of continuity of the intestinal tube, sometimes for a considerable space. Our surprise with respect to this fact is still the same, although there are numerous and frequent examples of these wonderful cures effected by the vital, repairing powers of nature alone. Nor, from what has been hitherto said with regard to the course employed by nature in effecting this curative process, can we as yet conceive a sufficiently clear idea of the means by which she begins and accomplishes this beneficent operation. For surgeons generally suppose, that as soon as the gangrenous loop of intestine, in hernia, is separated by the contraction of the external wound, the two open orifices of the intestine, having become adherent to the internal* edges of the wound, are gradually turned towards each other, and are at last so opposed to each other, that the feculent matter, descending from the superior† portion of the intestinal tube, passes direct-

* Central. † Atlantal.

ly into the inferior* portion of this canal. But this theory cannot be at all satisfactory to those who have had an opportunity of examining attentively, in cases of gangrened hernia, the respective position of the two apertures of the intestine, and their relations with the lips of the wound of the abdomen. Because the apertures of the intestine divided by the gangrene, are constantly placed in a parallel line to each other, and the superior orifice† is kept always in a state of dilatation by the feculent matters passing from‡ above downwards, by which it is likewise pushed outwards§ or towards the wound, while the lower aperture‖ of the divided intestine has a constant tendency to contract, and to retire inwards¶ towards the cavity of the abdomen. And the contraction of the wound, can never in any way give rise to a movement of approximation of the two orifices of the intestine opposite to each other. If this should even take place, the superior orifice** being already preternaturally dilated, and pushed forwards†† by the feces, could never be applied with sufficient exactness to the inferior contracted orifice‡‡ of the intestine drawn inwards§§, so as to be able to pour the feces directly into it, and to

* Sacral.

† The orifice leading to the stomach.

‡ From the stomach to the rectum.

§ Peripherad.

‖ Aperture leading towards the rectum.

¶ Centrad.

** The orifice leading towards the stomach.

†† Dermad.

‡‡ The orifice that leads towards the rectum.

§§ Centrad.

prevent a great part of them from continuing to pass out by the wound, during the rest of the life of the patient. These facts, contrary to the common doctrine on this subject, have been convincingly placed under my view, by the dissection of the bodies of those who have died at different periods, after the formation of an *artificial anus*, and by the examination of others, a long time after perfect recovery from this disease. From these observations, it has clearly appeared to me, that nature follows a quite different path in re-establishing the continuity of the intestinal tube divided by gangrene in hernia, from what has been hitherto imagined by writers of surgery; in which operation, she does not deviate from that simplicity of means which is peculiar to her.

§ 4. On the 1st June, 1803, a man about twenty-two years of age, was brought into this hospital, with a congenital hernia evidently gangrenous, in the left groin. On opening the tumor, a small portion of omentum was found in it, with a long loop of sphacellated ileum, which, on the stricture being removed, was cut away at some distance below* the ring; after this, the abdomen being emptied by the wound, the patient was relieved from his violent sufferings. On the following days, the remaining part of the gangrenous intestine separated spontaneously, and the wound assumed a healthy appearance. On the fourteenth

* Sacrad of.

day, the patient began to pass a part of the feces by the natural way. On the twenty-fourth and twenty-fifth days, having deviated from the diet prescribed for him, he was attacked by violent intestinal colic, with great tension of the abdomen, which symptoms ceased after a copious discharge by stool, procured by repeated glysters. On the 1st July the colic re-appeared, and on this attack the wound dilated, and allowed the discharge of a great quantity of feculent matter, and likewise several lumbrici. On the forty-second day after the operation the wound was nearly cicatrized, as there were only discharged very rarely a few drops of feculent matter; therefore the patient left the hospital. The following year, about the middle of March, this man, after repeated irregularities of diet, and especially after having eat crabs not properly cleaned from the shells and claws, was again attacked with violent pains of the bowels, from the severity of which he in a short time died. On the body being opened, there appeared in the abdomen a copious effusion of fluid, yellowish, feculent matter, the immediate cause of which had been a rupture that had taken place in the upper* portion of the ileum, a little above† the place where this intestine had become adherent to the elongation of the peritoneum, which previously formed the neck of the hernial

* Atlantal. † Atlantad of.

sac. From this rupture, several crab shells and claws ill bruised were seen hanging into the abdomen. The diameter of the ileum for a long space towards the stomach was three times greater than natural; on the contrary, the other portion of this intestine, corresponding to the rectum, was evidently contracted, and its orifice was discovered drawn more inwards* than that of the upper† portion. Both orifices met together at an acute angle opposite to the inguinal ring. This angle of union between these two portions of intestine was firm and compact, and still more so from having the omentum over‡ it, which had become adherent at that part. The corresponding portion of mesentery was also thicker and more consistent than usual. Lastly, all these parts which had contributed to restore the continuity of the intestinal tube in this patient, were found free from putridity, and therefore in a state of being distinguished from each other, especially the neck of the hernial sac, the two orifices of the divided intestine, and the surrounding peritoneum. From which circumstance, I was enabled to institute the following examination on this subject, without any risk of error.

§ 5. Having separated the great sac of the peritoneum from the cellular substance connecting

* Centrad. † Atlantal. ‡ Peripherad of.

the muscular and aponeurotic parietes of the abdomen, and having descended along it to the seat of the left inguinal ring, I found that the great sac of the peritoneum had not only become firmly adherent to the portion of the intestinal tube which had been unaffected by the gangrene behind * the inguinal ring, and properly speaking in the cavity of the abdomen, but likewise that this sac of the peritoneum, like a membranous *funnel*, extended from the cavity of the abdomen through the inguinal ring into the fistulous tube, communicating externally† by a narrow hole in the groin. And there could be no doubt that this membranous *funnel*, formed by the great sac of the peritoneum, was the same which previously formed the hernial sac; because it was evidently a continuation of the great membranous sac containing the viscera, extending through the inguinal ring, and because its texture and elasticity were the same as that of the peritoneum, and quite different and distinct from that of the cellular substance lying under‡ the common integuments of the groin. On laying open the ileum near to the mesentery, opposite to the inguinal ring, and on introducing a probe into the small aperture in the groin as far as the membranous funnel, and from thence into the superior§ portion of the intestine, I ascertained the direct way which the feculent mat-

* Centrad of. † Peripherad. ‡ Centrad of. § Atlantal.

ter had taken in its discharge by the wound from the time of the gangrenous portion being thrown off. Having then divided longitudinally at the same time, the external * narrow fistulous canal, and the membranous *funnel* formed by the neck of the hernial, sac I was enabled to see distinctly, that the two orifices of the intestine had remained in a direction parallel to each other, and without being at all turned towards one another, and a ridge projected between them, which of itself alone would have been sufficient to prevent the direct entrance of the feculent matter from the superior† into the inferior‡ orifice. Therefore, as in this patient, there was no doubt, that after the fourteenth day after the operation the feces had begun to resume their natural course, it was not difficult to comprehend, from the examination of the parts, that the alimentary matters had been poured from the superior orifice § of the intestine, first into the membranous *funnel* formed by the remains of the neck of the hernial sac, then from this by a half circle into the inferior orifice ‖ of the intestine. And it was precisely within this half circle of the membranous *funnel* that the shells and claws of the crabs had been accumu-

* Peripheral. † Orifice leading towards the stomach.
‡ The one leading towards the rectum.
§ Orifice leading towards the stomach.
‖ Orifice leading towards the rectum.

lated, which, on the obstruction of the passage of communication between the two orifices of the intestine, had occasioned the rupture of the superior* portion of the ileum, just above† the union of this intestine with the remains of the neck of the hernial sac.

§ 6. I met with the same arrangement of parts in the body of a woman, in whom several years before, in consequence of a gangrened femoral hernia, a small fistulous orifice had remained in the bend of the thigh, from which at intervals there issued a few drops of fluid feculent matter, but who had discharged her excrements very freely by the natural way for a long time, and even to the latest period of her life. The hernia, from what I learned, was very small; it had been formed merely by a segment of the circumference of the small intestine, and therefore, after the destruction of a part of the intestine produced by the gangrene, the angle formed within the femoral arch by the two portions of the ruptured intestine, would not be so acute as that in the preceding case. In the woman therefore, of whom I am speaking, the two orifices of the intestine, united together by an obtuse angle (*c*), were, in other respects, as in the case above mentioned,

* Atlantal. † Atlantad of.

(*c*) Pl. XI. fig. 1. c. d.

surrounded by and included in a membranous *funnel* (*d*), formed by the peritoneum or the remains of the hernial sac. The neck of the hernial sac, which, before the attack of gangrene, was without* the femoral arch, after the separation of the gangrened parts, being not affected by the mortification, had been drawn back, and carried, by the powers of nature, so far upwards† into the abdomen with the adhering intestine, that at the time of the woman's death from a quite different disease, the neck of the sac, with the two orifices of the intestine, were found some lines beyond‡ the femoral arch, and, properly speaking, in the cavity of the abdomen. The superior§ portion of the ileum (*e*) was larger and more dilated than the inferior‖ portion (*f*). On injecting water into the superior¶ portion of the intestine, I expected that it would pass without the least obstruction into the inferior** portion, considering that the whole circumference of the intestine had not been destroyed by the gangrene, and that the woman had for a long time had free passage by the anus. However, the water injected met with considerable resistance in its passage, and precisely at the angle of union of

(*d*) Pl. XI. fig. 1. e. e. b. b. (*e*) Id. m. (*f*) Id. n.

* Peripherad of. † Atlantad. ‡ Centrad of.

§ Atlantal. ‖ Sacral. ¶ Atlantal.

** Sacral.

the two portions of intestine, and the injected fluid was observed to make a half circle around the femoral arch, which it evidently elevated outwardly* under the integuments, before entering the lower† orifice of the intestine. In the body of this woman, as in the subject of the preceding observation, on separating the great sac of the peritoneum from the muscular and aponeurotic parietes of the abdomen, as far as the right femoral arch, there could be nothing more evident than that this great membranous sac, containing the abdominal viscera, extended under‡ the femoral arch, to form the membranous *funnel*(*g*), the base of which *funnel* included the two orifices of the intestine, and its apex was lost in the cellular substance lying under the common integuments, and in the narrow fistulous tube remaining in the bend of the thigh. On dividing this fistulous tube lengthwise, and along with it the membranous *funnel* formed by the peritoneum, the two orifices of the intestine appeared still more distinctly than before, united together laterally, and by an obtuse angle, in such a manner that the inferior§ orifice (*h*) was placed a little more behind‖ and lower¶ than the** superior (*i*). The promontory between

* Peripherad. † Orifice leading towards the rectum.
‡ Centrad of. § The orifice leading towards the rectum.
‖ Dorsad. ¶ More sacrad.
** Orifice leading towards the stomach.

(*g*) Pl. XI. fig 1. a. a. c. c. b. b. (*h*) Id. d. (*i*) Id. c.

the two orifices of the intestine (*k*) was neither so complete nor so prominent as in the subject of the preceding observation, nor such as to intercept all direct communication between the superior* and inferior† portions of the ileum; since in fact, a small space remained between this promontory and the side of the intestine over against the attachment of the mesentery (*l*). But this direct passage was so narrow, that not only the feculent matters, but even pure water forcibly injected, rather than dilate this contracted passage, descended from the superior‡ orifice into the membranous *funnel*, then turned back§ round the femoral arch, and afterwards entered into the lower‖ orifice of the ileum, and the fluid feculent matter followed the same route with the greater facility during life, in proportion as the external¶ fistulous opening continuing to contract, the base of the membranous *funnel* was drawn more inwards** towards the cavity of the abdomen, and yielded, in a greater degree, to the dilatation produced by the accumulation of the alimentary matters.

§ 7. I likewise had an opportunity of observing the commencement of such a process as I have

(*k*) Pl. XI. fig. 1. f. (*l*) Id. g.

* Atlantal. † Sacral. ‡ Orifice leading towards the stomach.

§ Dorsad. ‖ Orifice leading towards the rectum.

¶ Peripheral. ** Centrad.

just described, in the body of the man of whom I have spoken in another place (*m*), who died from the violence of the strangulation of a segment of the ileum, before the portion of strangulated intestine was detached from the sound part. This man, during the course of the disease, was affected at intervals with nausea and vomiting, although he had never ceased to have sometimes even very abundant discharges by stool. The inguinal hernia, which on the appearance of the first symptoms of incarceration was about the size of a hen's egg, on the fourth day had diminished so much, that it seemed to be nearly completely returned into the abdomen; which deceived the surgeon. On the eighth day, the symptoms of strangulation became more violent than before. During the following night, the patient discharged by stool, and by the mouth, excessively fetid black stuff and some lumbrici, and then expired. In examining the body after death, on removing the common integuments, the hernia appeared of a livid colour, and as if the whole tumor had been severely contused. The coverings of the hernia, and even the hernial sac (*n*), were become of an extraordinary density and thickness, and no longer separable from one another. Within the sac, a small loop of ileum presented itself (*o*), strangu-

(*m*) Memoir second, § 7.

(*n*) Pl. XI. fig. 2. g. g.

(*o*) Id. c. h. h.

lated by the neck of the sac, hard, blackish, and firmly adhering to the posterior * surface of the neck of the sac. Having injected water into the superior † portion of the intestine, it passed, though with difficulty, along that side of the intestinal tube which was not strangulated by the neck of the sac (*p*). And it is proper to mention, that, even during the life of the patient, the liquid feculent matters met with the same difficulty in their passage, as the superior ‡ portion of the ileum (*q*) was larger than the § inferior (*r*). On dividing the intestine lengthwise (*s*), I found the promontory already sufficiently evident (*t*), which on the detachment of the small gangrened loop of intestine, would have rendered the direct communication between the two portions of intestine much more obstructed, and more difficult to be overcome than it actually was. I likewise observed the commencement of the furrow *(u)*, which, as soon as the gangrened portion was detached, would have directed the fluid feculent matter from the superior ‖ orifice of the intestine into the membranous *funnel* formed by the remains of the neck of the hernial sac, and from

* Dorsal aspect. † Atlantal. ‡ Atlantal.

§ Sacral. ‖ Orifice leading towards the stomach.

(*p*) Pl. XI. fig. 2. d. (*q*) Id. a. (*r*) Id. b.

(*s*) Pl. XII. fig. 1. c. c. (*t*) Id. d. (*u*) Id. f. g.

thence, by a half circle, into the lower * orifice of the intestine.

§ 8. In the dead bodies of hernial patients, I have repeatedly formed artificial strangulations upon the ileum protruded in the hernia, constricting sometimes one third, sometimes two thirds of its circumference. I have then injected water into the superior † portion of the intestine, and I observed, that when the intestine in the hernia had been constricted in two thirds of its diameter, the water passed through it with great difficulty, or not at all, because the angle, which the bowel formed on the side next to the attachment of the mesentery, was so acute, that the projection within the intestine entirely prevented the direct communication of the two portions of the intestinal tube. On constricting even one third of the whole circumference of the intestine, I have remarked, that there are occasionally circumstances, owing to which the angle formed at the strangulation is sometimes more, sometimes less acute, which makes the promontory project more or less forwards, and oppose a greater or less resistance to the passage of fluids through the constricted part. I am of opinion, that, even in the case of disease, it is not always the side of the intestine directly opposed to the attachment of the mesen-

* The orifice leading towards the rectum. † Atlantal.

tery, which is engaged in the strangulation, but that it is sometimes the anterior *, sometimes the posterior † wall, which is constricted. This circumstance produces a very remarkable difference with regard to the greater or less acuteness of the angle which the two portions of the intestinal tube make, between this stricture and the attachment of the mesentery, and has a great influence upon the interruption, or total stoppage, of the alvine discharges during the incarceration. On which account, we may have occasion in practice to observe, as has been already remarked by some writers, that although only a third of the whole diameter of the intestine has been strangulated, the symptoms of strangulation continuing, the feces in some cases do not cease to pass by the rectum, while in other cases they are entirely suppressed.

§ 9. It is a fact well known to all surgeons, that if a loop of intestine is attacked with gangrene from violent strangulation, the hernial sac does not always consequently become sphacellous at the same time with the intestine and omentum. And even in cases, in which the sac of the hernia is affected with gangrene, together

* Convex periphery. † Concave periphery.

with the protruded viscera, as the line of separation of the putrid parts forms without * the inguinal ring, it follows from that, almost constantly, that that portion of the neck of the hernial sac situated within † the ring towards the abdomen, remains sound and unaffected. Therefore, in both cases, as soon as the sphacellated portion of protruded intestine is separated, the neck of the hernial sac, without or within ‡ the ring, includes the two orifices of the intestine, which in general have formed adhesions to it, in consequence of the preceding inflammation, and serves to direct the feculent matter to the wound for a certain time, so that none can be effused into the cavity of the abdomen; then in proportion as the wound contracts, the neck of the hernial sac on the side next the abdomen forms into a membranous *funnel*, or canal of communication, between the two orifices of the intestine divided by the gangrene. And it is a certain fact, confirmed by a very great number of observations, that after the separation of the gangrene, the two sound segments of intestine retire gradually beyond § the ring towards the cavity of the abdomen, notwithstanding the adhesion which they have contracted with the neck of the hernial sac; whether this is caused by the tonic and retractile action of the intestine

† Peripherad of. † Centrad of. ‡ Peripherad or centrad of.

§ Centrad of.

itself, and of the mesentery, or rather by the puckering of the cellular substance, which unites the neck of the hernial sac to the abdominal parietes within * the ring. And this phenomenon is likewise constant and evident even in herniæ not gangrenous, but merely complicated with *fleshy* adhesions of the intestine to the neck of the hernial sac, and therefore irreducible. In these herniæ, as I have shown (*x*) in another place, the immediate cause of the strangulation being removed, the intestine, together with the hernial sac, gradually rises up † towards the ring, and at last is concealed behind ‡ it. And it ought not to be inferred from this, that the omission of passing a thread through the mesentery, in a case of intestine gangrenous, but unattached to the neck of the hernial sac, is attended with danger to the patient; as the proper retraction of the intestine and of the mesentery is never so quick as the *adhesive* inflammation, which invariably affects these parts immediately after the operation, and causes the divided extremities of the intestine to become adherent to the remains of the neck of the hernial sac, in the course of twenty-four hours. In a case of gangrened intestine still free from adhesion, I passed a ligature through the mesentery. I removed the ligature in twenty-four hours, and on

* Centrad of. † Atlantad. ‡ Centrad of.

(*x*) Memoir second, § 28.

introducing a finger into the bottom of the wound, I found the intestine adhering all round. This and several other similar facts which I could adduce, are well known to many of my pupils. In the bodies of those who have had the misfortune not to survive the gangrene of the intestine, I have repeatedly demonstrated, that although the intestine was not attached at the time of the operation, and although I had omitted to pass the ligature through the mesentery, the intestine was found adhering to the neck of the hernial sac without the least appearance of effusion of feces into the abdomen. The retraction of the orifices of the divided intestine takes place with certainty, but slowly, and always along with the neck of the hernial sac, with which it quickly forms adhesions.

§ 10. This retractile process of the neck of the hernial sac and of the intestine, is completed in the shorter time, the smaller and more recent the hernia is, for this reason principally, that the layers of the cellular substance situated behind * the peritoneum, and those of the neck of the hernial sac, preserve their elasticity and readiness to contract, in a greater degree in small and recent hernia, than in those that are large and of long standing. And the communication of the superior ori-

* Peripherad of.

fice * of the intestine with the inferior orifice †, takes place the more readily, the smaller the loss of substance of the intestine, when, for example, only one third of its circumference has been found strangulated, and precisely that side of the intestine opposite to the attachment of the mesentery. Because in this case, however small the retraction of the neck of the hernial sac towards the abdomen, the resulting membranous *funnel* is always sufficiently large to supply the want of a third of the side of the intestine destroyed by gangrene. In fact, observation and experience have taught us, that in these circumstances the alvine evacuations very soon re-appear. On the contrary, in the other cases of gangrened hernia, in which the sphacelus has destroyed the whole loop of protruded intestine, as the two orifices touch each other on one side, almost in a parallel line, and form a very acute angle on the side next to the mesentery, the promontory which rises and projects forwards ‡ between the two apertures of the intestine, entirely prevents the direct communication between them, and therefore, of necessity, the feculent matters, for a long time, cannot pass out § by any other way but by the wound. Afterwards, the two orifices of the intestine, re-

* The orifice leading towards the stomach.

† The orifice leading towards the rectum.

‡ Dermad. § Peripherad.

tracting gradually more beyond* the ring into the cavity of the abdomen, and the neck of the hernial sac along with them, the latter begins to form the membranous *funnel*, and then some marks of incipient communication are observed between the two portions of divided intestine. But as this *funnel*, or membranous passage, between the two orifices of the intestine, is still very narrow, in comparison with the size of the external wound, so the quantity of feculent matter passing out † by the wound is much greater than that which takes the way of the rectum. Finally, the intestine, daily rising more up ‡ into the cavity of the abdomen, along with the neck of the hernial sac, and the base of the membranous *funnel* necessarily enlarging, while its apex contracts, together with the external § wound, the passage of communication between the two orifices of the divided intestine at last becomes so large as to permit the feces to abandon the fistula entirely, and making a half circle from the superior orifice ||, they enter the inferior aperture ¶, and pass solely by the natural way.

§ 11. After having shown, in the most convincing manner, that the funnel-shaped membranous

* Centrad of. † Peripherad. ‡ Atlantad. § Peripheral.

|| The orifice leading towards the stomach.

¶ The orifice leading towards the rectum.

passage of which we are speaking, formed by the neck of the hernial sac, appears very distinctly in the dead bodies of those in whom the artificial anus has been closed for a long time prior to their death, it is, in my opinion, likewise easily demonstrated, that the re-establishment of the continuity of the two portions of the intestinal tube could never be effected, if the truncated extremities of the intestine, after the separation of the gangrene, remained always attached to the tendinous margin of the inguinal ring, or of the femoral arch, as surgeons have generally supposed. This is as much as to say, if, after the separation of the gangrene, the two orifices of the intestine were not drawn so far into the cavity of the abdomen, along with the neck of the hernial sac, as is required for the feculent matter which descends from the superior orifice*, finding a space sufficient to allow it to make a half circle and turn back into the lower portion†; which circumstance seems to have escaped the observation of those who have been engaged in these investigations, particularly of Morand(*y*) and Pipelet(*z*). For it is evident, that, without the interposition of the membranous *funnel* of the peritoneum between the two

* The orifice leading towards the stomach.

† Into the orifice leading towards the rectum.

(*y*) Mémoires de l'acad. des Sciences de Paris, an 1735.

(*z*) Mémoires de l'acad. royale de chirurg. tom. XI.

orifices of the intestine and the external* cicatrix, there would be nothing to supply the want of the gangrened portion of intestine, and the divided extremities of it being disposed in a parallel line to each other, and adhering to the tendinous margin of the inguinal ring, or of the femoral arch, and to the internal† lips of the wound, might shrink together from the contraction of the wound, but would never be turned towards each other, so as to become opposite, and re-establish the continuity of the intestinal tube; if this did not take place, the discharge of feces by the wound would be perpetual and incurable in every case of gangrened hernia.

§ 12. With regard to this fact, it appears to me that it will be proper to attend to the question, why we so frequently see the continuity of the intestinal tube re-established after sphacellated inguinal or femoral hernia, while cases of penetrating wounds of the abdomen with protrusion of gut, if the protruded portion of intestine passes into a gangrenous or sphacellated state, as in the case related by Moscati (*a*), or has been partially or completely divided, as in the histories related by Stalpart-Wander-Wiel (*b*), Cabrolius (*c*),

* Peripheral. † Central.

(*a*) Mémoires de l'acad. royale de chirurg. tom. VIII.

(*b*) Observ. rar. tom. II. obs. 25. (*c*) Oper. Med. obs. 13.

Hildanus(*d*), Plater (*e*), Harwis (*f*), and several others (*g*), the most favourable event which it was possible to obtain was the perpetual and incurable fistula. I cannot give any other plausible explanation of this phenomenon, but that which is drawn from the comparison of the circumstances in which a wound of the abdomen, with prolapsus and gangrene of the intestine, differs from a hernia, and in particular, that the protruded and divided intestine consequent to a wound or gangrene has no hernial sac, and consequently no membranous *funnel* surrounding its two orifices, while the gangrened intestine in hernia never fails to be included in the neck of the hernial sac. The peritoneum divided by the wounding instrument is drawn back, and the two orifices of the intestine divided by the injury or by gangrene, placed in a line parallel to each other, immediately contract adhesions with the internal * and external † lips of the wound of the abdomen. And in this kind of adhesion, no retraction of the trun-

* Central. † Peripheral.

(*d*) Centur. I. obs. 74. (*e*) Obs. med. lib. III. pag. 880.

(*f*) Ephemerid. n. c. an. I, II. obs. VI.

(*g*) I do not include in this number the sailor mentioned by Dessault, tom. II. The circumstances of this case do not appear to me clearly explained, especially in what regards the preceding state, to enable us to draw accurate conclusions from it.

cated extremities of the intestine can take place towards the cavity of the abdomen, because the lips of the wound of the abdomen have not the flexibility and ductility of the cellular substance which unites the peritoneum to the muscular parietes of the abdomen, nor, as is observed in the neck of the hernial sac, the aptitude to re-enter along with the intestine adhering to it, after gangrene in hernia. Therefore, in a case of wound, the feces descending from the superior orifice* of the divided intestine, are always on a level with the skin, and pass out continually by the wound, and perpetuate the artificial anus, while in the second case, they turn aside into a membranous passage of communication between the two apertures of the intestine. We see the same thing happen in those ventral herniæ, which occur in consequence of injuries of the abdomen, a long time after they have cicatrised, if the herniæ unfortunately become gangrenous, as well as after wounds with prolapse and injury of the intestine. It also very rarely happens, that even the umbilical and the large old ventral herniæ, although provided with a hernial sac, are not followed by a perpetual discharge of the feculent matters, if they are attacked by gangrene and sphacelus; because, if the hernia is very large and of long

* The orifice leading to the stomach.

standing, its hernial sac, adhering very firmly to the aponeurosis of the abdomen and to the integuments, being unprovided with cellular substance capable of shrinking, loses the property of assisting the retraction of the intestine towards the cavity of the abdomen, to form the membranous *funnel* of communication between the two orifices of the intestine divided by the gangrene; therefore, the feces are not discharged in any other way but by the wound of the umbilicus, or other part of the abdomen.

§ 13. As the advantage, therefore, is so great, which, after the separation of the gangrened parts in hernia, is derived from the retraction of the neck of the hernial sac, and of the orifices of the intestine which have adhered to it during the inflammatory stage of the strangulation, or a short time after the operation, that the re-establishment of the continuity of the divided intestine is principally owing to that retraction, no one, in my opinion, will think that we ought not to banish from surgery the practice of uniting the divided extremities of the intestine to the lips of the wound, in order to retain them there forcibly. They will also agree, that the passing of a ligature through the mesentery, in order to prevent as much as possible the retraction of the intestine, and of the neck of the hernial sac, ought henceforward to be con-

sidered, not only as a useless, but even a hurtful method (*h*). I have already said above, that in most cases, the adhesion contracted by the intestine with the neck of the hernial sac during the inflammation which precedes the gangrene, makes this useless and hurtful practice superfluous; but that even in cases, in which the gangrened loop of intestine is free from attachment to the neck of the sac, it is not at all necessary to pass a thread through the mesentery (*i*), in order to retain it forcibly on the outer part *; because the adhesion, which has not come on before, supervenes

(*h*) Paletta is one of the first who observed this fact. *See Giornale di Medicina di Venezia, tom VIII. pag.* 435.

(*i*) The truth of these remarks is likewise confirmed by the very accurate observations and experiments of Mr. Travers, who, on the subject of the ligature of the mesentery, thus expresses himself: "I am convinced, from observation of the dis-"ease, and the effect of a stricture upon the intestines in arti-"ficial imitations of it, that the strangulated gut is always "fixed by adhesion where it quits the belly, and that this ad-"hesion creates much of the impediment commonly experi-"enced to the return of the gut in the operation. If the stric-"ture is of the primary species, the adhesion is recent, and "opposes little resistance: in the secondary strangulation, it is "often quite impossible to overcome it; and the bowel must "remain in the sac. In all cases, it is fully sufficient to hold "the intestine in its place. It follows upon this representa-"tion, that the ligature is at least superfluous." *Inquiry into "the process of nature, in repairing injuries of the intestines,* &c.—T.

* Peripheral aspect.

in a short time after the parts are laid bare; and the gangrened portion of the intestine remaining without * the abdomen, after the removal of the immediate cause of the strangulation, during the process of separation of the gangrened from the sound portion, the latter becomes adherent to the neck of the hernial sac in the vicinity of the ring, and within † it, without there being any risk of effusion of the feces into the abdomen. And if in the bodies of those who have died in a very short time of gangrened hernia, the feces have sometimes been effused into the cavity of the abdomen, it is because in these persons the intestine had burst beyond ‡ the inguinal ring, and in fact within the abdomen, from the exit of the excrementitious matters being entirely precluded by the external § wound, occupied by the strangulated portion of intestine. And, if in some other cases, the portion of intestine free from attachment to the neck of the hernial sac, has been found in the dead body returned into the cavity of the abdomen with effusion of feculent matter, there can be no hesitation, that this return has been caused by the last expiring of the patient, when we see all the viscera return into the abdomen, which becomes relaxed. This undoubtedly does not take place in the living subject, and during the alter-

* Peripherad of. † Centrad of. ‡ Centrad of.
§ Peripheral.

nate action of the diaphragm and abdominal muscles.

§ 14. The aphorism of Hippocrates (*k*), *Si quod intestinorum gracilium discinditur, non coalescit*, is a true and constant fact, in the proper sense in which it ought to be considered, *i. e.* in respect to the mode of cure already known of simple wounds of other soft parts of a different texture from that of the intestines. For wounds of the intestines never heal by a mutual coalescence of their raw edges, as those of the integuments, of the muscles, and of other soft parts, but solely by means of the *adhesive* inflammation of the peritoneum, or by the application and adhesion of the injured portion of the intestine to the great sac of the peritoneum, or to its expansions, such as the external membrane of the contiguous intestines, or that covering the other abdominal viscera. Littre (*l*) relates the case of a madman who gave himself eighteen stabs with a knife in the abdomen, eight of which were penetrating wounds with evident injury of the intestines. He recovered in two months; but, having afterwards relapsed into a state of delirium, he was killed by throwing himself out of a window. On examining his body, the cicatrices of the intestinal canal

(*k*) Sect. IV. aphor. XXIV.

(*l*) Acad. royale des sciences de Paris, an. 1705.

were observed, some of which adhered to the great sac of the peritoneum, others were in firm contact with the neighbouring convolutions of the intestinal canal, none of them were formed by the reciprocal union of the lips of the wound of the intestine. The peritoneum, when irritated, has a singular disposition to inflame round the part irritated, and when applied to any part to become adherent to it. A wound from a cutting instrument, or that produced by a ball passing through several convolutions of intestine, heals in no other way but by the adhesion of a portion of the injured intestine with the internal * surface of the sac of the peritoneum, or with the external † membrane of the abdominal viscus with which it is in contact, which is indeed the peritoneum (*m*); and this contact is maintained constantly by the pressure which the muscular parietes of the abdomen and the diaphragm exercise alternately upon the viscera of the abdomen, in the state of inspiration and expiration. And the same process takes place after gangrene of the intestine, as when

* Central. † Peripheral.

(*m*) Platner, Institut. Chirurg. § 694. Illud enim ante omnia tenendum est, intestinorum, ventriculi, aliorumque receptaculorum vulnera, si sanescunt, non ita glutinari atque alia vulnera. Nam neque ore ita adducuntur ut se contingant, et inter se coeant, neque vulnera superveniente carne implentur, sed pars vulnerata jungitur aliis, quæ prope sunt, cum quibus media cicatrice concrescit.

it is simply wounded, for it appears from what has been hitherto said, that in a case of hernia after the separation of the gangrenous from the sound parts, the re-establishment of the continuity of the intestinal tube, can only be effected by means of the adhesion of the two divided extremities of the intestine to the neck of the hernial sac, or to the peritoneum, which in the manner of an intermediate portion, or extensive cicatrix, supplies the deficient portion of intestine.

§ 15. The celebrated surgeon La Peyronnie, having observed that the contraction of the external wound, and the cicatrix of the artificial anus, were accomplished the more quickly the more regular the patient was in his diet, was of opinion, that in every case of this kind, surgeons ought to keep the patient on a very low diet, if they wished effectually to avoid the perpetual fecal fistula. This opinion seemed the more important, from experience having shown, that very frequently in these patients, irregularities in diet, during the course of the suppuration of the wound, and especially after the artificial anus was closed, had occasioned frequent painful intestinal colics, which were not unfrequently fatal. Louis, in a memoir on this subject, very judiciously pointed out, that although the precept given by La Peyronnie might appear prudent and rational, it was

however in direct opposition to the primary indication which the surgeon proposes to fulfil in the cure of this disease: that is, that the rigid diet, precisely from contributing to make the wound contract rapidly, and the artificial anus close quickly, instead of promoting the perfect and safe cure of the patient, is even, in most cases, the principal cause of the colics to which the patient is liable during the treatment of this disease, and more frequently also, and with greater danger to the life of the patient, after the wound is cicatrized. For, he said very judiciously, if the perfection of the cure of the fecal fistula, and of the artificial anus, and the security of the life of the patient, consist in giving the greatest possible size to the mode of union, whatever it be, between the two orifices of the divided intestine, before the wound contracts too much, so as to prevent the discharge of the feces by it, it is proper that during the cure, instead of keeping the patient on a low diet, he should be nourished very abundantly with substances easy of digestion, and which will pass readily through the intestinal canal, that, by means of the distention produced by the alimentary substances, the place of union, or of continuity of the intestine, may gradually be sufficiently dilated, before the fecal fistula, or artificial anus, contracts or closes. For which purpose, as has been mentioned, besides an abundant diet of food easily digested, much advantage is derived from those means

which are adapted to accelerate the course of the feculent matter through the intestinal canal, such as clysters frequently given, and mild purgatives at intervals. But if in any case, notwithstanding the employment of all these means of dilatation, the passage of communication between the superior and inferior * portion of the divided intestine were so strait, and so strongly resistant to the distention, as not to yield in any way to the proper enlargement, it is evident, that it would always be more advantageous for the patient to continue to be nourished abundantly by food of easy digestion, keeping the artificial anus open and dilated, than to expose himself by a very low diet to become emaciated, and cause the quick closure of the fecal fistula, with evident danger of losing his life in a short time under the most violent sufferings. This argument is strengthened by practical observations, as I shall presently show.

§ 16. I have proved above, that the greater or less facility of the passage of the feces, from the superior into the inferior † orifice of the intestine divided by gangrene in hernia, depends, in the first place, on the greater or less retraction of the

* Atlantal and sacral.

† From the orifice leading to the stomach, into that leading to the rectum.

neck of the hernial sac, and of the intestine along with it, from the inguinal ring, or femoral arch; and in the second place, on the greater or less degree of dilatation, produced by the alimentary matters at the base of the membranous *funnel*, formed by the neck of the hernial sac, which constitutes the passage of communication between the two orifices of the intestine divided by the gangrene. When, therefore, the loss of substance of the intestine has not exceeded one third of its circumference, there will be every reason to hope, that, in a short time, the feculent matters will succeed in depressing the promontory (*n*) interposed between the two orifices of the intestines, and that they will resume their natural course along the sound and uninjured side of the intestine, abandoning that of the wound. But in those cases, which are unfortunately the most frequent, in which the whole intestinal loop has been destroyed by the gangrene, since the promontory, besides projecting much forwards * between the two orifices of the intestine, is likewise hard and resistant to the distention, from being formed by the wall of both portions of the intestine, which touch each other in a parallel line, and at an acute angle on the side next to the mesentery, it is not to be expected that a passage for the feces can be ob-

(*n*) Plate XII. fig. 1. d. Pl. XI. fig. 1. f.

* Dermad.

tained at this place but by means of the farther retraction of the neck of the hernial sac, and of the intestine, and a greater dilatation of the base of the membranous *funnel*, formed by the neck of the hernial sac, than in the preceding case. On which account, in similar cases, which, I again observe, are the most frequent, nothing in my opinion can contribute more effectually to produce the desired effect, than the abundant quantity of alimentary matters of good quality, and of easy digestion, pushed and forced, to use the expression, through that narrow passage, that they may press the base of the *funnel* inwards, and enlarge it, and take a half turn, the least narrow and angular that is possible, in their course from the superior into the inferior * orifice of the detached intestine.

§ 17. I could adduce many cases from my surgical practice, in confirmation of the justness and utility of this process; but the following, although few in number, will be sufficient, in my opinion, to illustrate and confirm my assumption:—A loop of gangrened intestine, about six inches long, was cut away in a woman fifty years of age, affected with hernia (*o*). The feculent matters were dis-

* From the orifice leading to the stomach, into that leading to the rectum.

(*o*) Pipelet, Acad. royale de chirurg. tom. XI. p. 262.

charged by the wound for so long a time, that having lost all hope of a radical cure, it was thought the best plan for the patient to keep the artificial anus forcibly dilated. This patient committed an error in diet, and this error proved salutary to her: for a purgative of cassia and manna having been prescribed for her on this account, the excrements, which had passed by no other way but by the wound for four months, the same day resumed their natural course, in consequence of which the artificial anus was closed and cicatrized in a fortnight. A man likewise (*p*),

(*p*) Mauchart, *De Epiploo-enterocele crurali* Dissert. Cum foramen ulceris atque intestini magis magisque se contraheret arctius, et aliquot septimanarum spatio non nisi fluidiora transmitteret, remanentibus crassioribus fæcibus, supervenit nova abdominis distensio flatulenta, quamvis non nisi fluida et juscula hauriret patiens; imo cum et angustum hoc orificium cicatrice penitus occluderetur, pristina denuo ludi tragædia, redire, vomitus et inflammatio, et tensio abdominis dolorifica cœperunt. Sub novis hisce angustiis injecit D. Warner intestino recto per anum clysmata aliquot, mediante vescica bubula, dein syringa, qua per vices impulit copiose, fortiterque in anum mox oleosa emollientia, mox stimulantia, donec eadem via copiosæ fæces alvinæ excernerentur, et vomitus æque ac abdominis molesta inflatio cessarent, atque æger successive naturali per anum excretione fæcum constanter gauderet per viginti duo fere annos.——In cadavere duo intestini ileon, quod olim magnam substantiæ, et longitudinis jacturam fecerat e putredine sphacelosa, extrema tam arcte per cicatricem coalita, mediantibus peritonæi processibus reperta sunt, ut sufficiens atque liber fæcum commeatus permanserit ad anum, licet in-

some weeks after having laboured under a gangrened femoral hernia, the external aperture of the wound having contracted, was attacked again with symptoms quite similar to those of strangulation, although he had been kept on a very low diet. Glysters, at first emollient, afterwards stimulant, were speedily applied, by means of which the feces were excited to force a passage opposite to the femoral arch, and then were discharged in great quantity by the anus, and continued to pass that way for twenty-two years, at which time this patient died of a quite different disease. On opening the body, it was found that the two apertures of the intestine, which had been divided by the gangrene, communicated with each other by means of the interposition of the peritoneum, or, as I have pointed out, by means of the membranous *funnel* formed by the remains of the neck of the hernial sac; and although the intestine at that place was more contracted than natural, yet it left a sufficiently free passage for the feces.

Petit (*q*) relates a case similar to this, in which the symptoms of strangulation were about to return in consequence of the too rapid contraction of the wound, in spite of the low diet to which the patient had been confined. Petit ordered glysters

testini diameter aliquantisper naturali angustior in loco coalitus fuerit.

(*q*) Oeuvres posthumes, T. II. p. 403.

to be employed, which I suppose were stimulating, and from that period the feces gradually ceased to pass by the wound, and resumed their course by the rectum.

In the same manner, in a peasant thirty-five years of age (*r*), gangrene took place in an inguinal hernia of the left side, with which he had been affected from the age of eighteen. The cure was abandoned entirely to the efforts of nature. On the separation of the dead from the living parts, this man would never observe any regularity, and continued even to eat immoderately, so that it was necessary to renew the dressings every minute. He was told, that if he continued to gratify his great appetite as he did, he would have a perpetual fecal fistula. He persisted nevertheless in the same conduct, and it was necessary to leave him to himself. There was no perceptible change in the wound for six weeks. After this time the sore began to contract. Towards the eighth week, the patient passed by stool a considerable quantity of mucus, and afterwards feces. The alvine evacuation successively increased, and the discharge by the wound diminished, so that in about three months after the accident, the feces were discharged entirely by the rectum, and the fecal fistula closed

(*r*) Bulletin des sciences méd. publié au nom de la societé med. d'emulation. Paris, an. 1809. *See likewise Lee, Medical Society of London, an.* 1807.

without the patient being afterwards troubled with intestinal colics. We might refer to the same head, the histories, which are very numerous, of patients, who, with a similar disease, have remained in an hospital for many months on a low diet, and notwithstanding with the artificial anus always open, and who, on leaving the hospital, and resuming the exercise of their trade, and nourishing themselves abundantly with food of good quality, and easily digested, have begun to discharge the feces by the natural way, and in progress of time, more and more freely, so that they have been cured of the artificial anus.

§ 18. It is necessary to mention, however, that this point of practice requires unusual prudence and circumspection on the part of the surgeon. For if it is true on the one hand, that the too great anxiety to close the artificial anus, exposes the patient for a considerable time to the danger of being attacked with frequent, and sometimes even fatal colics, it is equally true, that all the circumstances being favourable to the complete cure, the keeping the fecal fistula for a long time unusually dilated, renders the patient unhappy during all the rest of his life, without that practice being necessary. On which account, I am of opinion, that if after an abundant allowance of easily digested food, continued for some weeks, and the uninterrupted use of slightly stimulating glysters,

and gradually of some purgative, the feculent matters take by degrees their course by the rectum, and abandon that of the fistula, without occasioning frequent or very painful colics, so that, attending to the still considerable calibre of the fistula, there is every reason to believe, that the distention produced by the alimentary matters, has been sufficient to dilate the base of the membranous *funnel* formed by the neck of the hernial sac as much as is required. From these signs may be deduced well grounded hopes, that the communication has been re-established between the two orifices of the intestine, so as to allow the wound to be closed without the patient being exposed to the danger of severe accidents in consequence of it. In doing this, the surgeon will abstain from making any sort of pressure on the wound in order to hasten its cicatrization, both because experience has shown me, that patients in similar circumstances cannot endure this pressure, however slight it may be, as the depressing the cicatrix diminishes the size of the subjacent *funnel* or passage of communication between the two orifices of the intestine, and, lastly, because nature, even in the most fortunate case of this kind, and after every care has been employed to obtain a complete cure, leaves almost constantly a small canal open externally, from which are discharged at intervals, sometimes for several years, a few small drops of very fluid feculent

matters which do not soil or incommode the patient. And considering the frequency of this phenomenon, I am of opinion, that notwithstanding the most favourable circumstances for obtaining an absolutely complete cure of the wound, it is never proper to allow this small hole situated in the centre of the cicatrix of the artificial anus to close entirely, at least not till a very long time after the patient has begun to pass the feces completely by the natural course. It is also of advantage, in my opinion, to keep this canal open by means of a small bougie of elastic gum, which does not occasion the patient any inconvenience, from its size, length, and flexibility, and may be of great benefit to him in the case of an unexpected accident produced by the stoppage of ill-digested substances in the membranous passage of communication between the two orifices of the divided intestine. But if, contrary to all that has been hitherto said, and notwithstanding the abundant use of food of easy digestion, of frequent glysters, and occasional purgatives, the feculent matters, after the lapse of several weeks from the accident, continue to flow wholly or in great part by the wound, and if, in proportion as it tends to contract, the colics become more frequent and more violent than before, we may conclude that the two orifices have not as yet retired sufficiently within the edges of the inguinal ring or of the femoral arch, and have not drawn along

with them a sufficient portion of the neck of the hernial sac, in order to form with it the membranous *funnel*, or passage of communication, of such a size as is required for allowing the semicircular course to the feces. In this state of affairs, the surgeon would commit a great error, if he did not employ every means for keeping the artificial anus dilated and open, in a due proportion for allowing the easy discharge of the feculent matters by it. The surgeon will therefore, in the first place, dilate the fecal fistula by means of prepared spunge, and will keep it of a proper size by introducing a large tent of linen, lint, or elastic gum. This tent at first will prove a little uneasy to the patient, but he will become accustomed to it, provided it is not too long. The alimentary matters will be retained at intervals, in order to allow time and opportunity for the absorption of the nutritive portion, and by means of the tent the patient will be secured against the inversion of the intestine, an accident against which he ought always to be on his guard.

§ 19. The inversion of the intestine is one of those troublesome inconveniences, which occurs not only in those cases in which the passage of the feces by the natural way is totally closed, but likewise in those where part of the feculent matters are discharged by the fecal fistula, and part by the natural way. The following case will

prove the truth of this assertion:—Dominico Paoli, twenty-five years of age, was operated on by me for a gangrened scrotal hernia of the left side. As soon as I had made an incision into the lower mortified part of the small intestine, and removed the immediate cause of the strangulation, a great quantity of fluid matter was discharged from the wound, followed by several lumbrici, with great relief to the patient. On the gangrened parts being separated by the efforts of nature, the orifices of the divided intestine and the neck of the hernial sac retired beyond the inguinal ring, and the cure went on daily very favourably. After some weeks the feces resumed their natural course, the wound contracted, and only transmitted at long intervals a very little thin, yellowish, feculent matter through a small opening in the centre of the wound; in which state the patient left the hospital. He remained very well for three years; for neither the labours of the country, nor the coarse diet, caused any considerable pains in his belly, nor retarded the alvine excretions. At this time he was attacked by a violent cough, which troubled him incessantly for several months; after this the small aperture in the centre of the cicatrix began to enlarge, and then to discharge a greater quantity of feculent matter than usual. Afterwards a small red tubercle protruded at this hole, which gradually increased so as to form a tumor two inches and a

half long, and in breadth equal to such a portion of inverted small intestine. In proportion as this reddish tumor became larger and projected outwards, the alvine excretions diminished, and were at last totally interrupted. The patient returned to the hospital in this state. I did not find any difficulty in returning the inverted intestine completely; I then introduced into the fistulous canal a tent of linen about the size of the finger, an inch and an half long, which was directed towards the left side. A few hours after the introduction of the tent, the patient, to my very great astonishment, repeatedly went to stool, in spite of the presence of the tent in the fistula, and without previous pains of the abdomen of any consequence. I continued to apply the same dressing for a week, after which I removed the tent, and only placed a pledgit of caddis opposite to the orifice of the fistula, trusting that the fistulous canal, when left to itself, would have again contracted so much as to prevent the inversion of the intestine, as it had done the preceding years. But the case terminated differently; for although the patient was kept constantly in bed, and used daily three or four glysters, sometimes emollient, sometimes stimulant, and occasionally a gentle purgative, and was no longer troubled with the cough, yet the fistula did not contract, the alvine discharge again became scanty, and the intestine

was inverted outwardly * as before. I again introduced the thick tent an inch and a quarter long, and immediately afterwards the feces resumed their natural course, so that very little passed by the wound. I then ascertained the necessity of the patient wearing the tent constantly, as the only means of preventing the inversion of the intestine, to remove the feces from the fistula, and direct them towards the rectum. I tried various instruments which appeared to me proper for keeping the tent firmly in its situation; but none of them could be endured by the patient, especially when he was standing or walked about, although they only produced a moderate pressure. My intention was most perfectly answered by a compress supported by a T bandage. This patient continued to wear the tent for two years, and went about his ordinary affairs.

There results from this fact; 1*st*, That the inversion of the intestine may take place, although there be a sufficiently free communication between the two orifices of the intestine, by means of the membranous *funnel;* 2*dly*, That the inversion of the intestine may occur several years after the cicatrising of the fistula, through the small hole which almost always remains in the centre of the cicatrix; 3*dly*, That a free communication existing, previous to the inversion, between the two ori-

* Peripherad.

fices of the intestine by means of the membranous *funnel*, on the inverted portion of intestine being replaced, and kept in its situation by the introduction of the large tent, the feces resume their natural course, in spite of the presence of the tent in the fistula; 4*thly*, That after the replacement of the inverted intestine, the fistulous tube not showing any disposition to contract, and the intestine being disposed to become again inverted, the only expedient to be followed is, the keeping the tent permanently within the fistula, by means of the above mentioned bandage.

§ 20. The miserable state in which the patient is after the premature and unseasonable contraction of the artificial anus, or the stoppage of some ill-digested substance, or of worms, in the half circle which the feculent matters take in the membranous *funnel*, is not unlike that in which he was situated when the hernia became strangulated. He is attacked with acute pain in the situation of the fistula, tension of the abdomen, and then with vomiting and hiccup, with an irregular pulse, and general prostration of strength. In these distressing circumstances, if he is not speedily relieved, he dies in a short time, in consequence of a rupture of the intestine, and effusion of feculent matters into the cavity of the abdomen. And this rupture always takes place in the

upper * portion of the intestine greatly distended, a little above the promontory, and contiguous to the point of union of the † superior orifice of the intestine with the base of the membranous *funnel.* In the greater number of these cases, observation and experience have taught me, that much precious time is lost in the administration of useless remedies, with the exception of frequent glysters. It would appear that purgatives ought to be the remedies, in which the greatest confidence should be placed, if the surgeon were able, in every case, to calculate with sufficient certainty the degree of resistance which is opposed to the passage of the feculent matter within the membranous *funnel.* But this is precisely the point of which we are ignorant, and therefore, it happens in most cases, that the purgative medicine is either rejected, or that the impulse given by it to the feces, far from promoting their progress by the natural way or by the artificial anus, rather accelerates the rupture of the intestine, and the effusion of the feces into the abdomen. In these severe and very urgent cases, there is undoubtedly only one means of saving the patient, that is, the quick evacuation of the feculent matter by the fistula. If the fistulous tube is not very much contracted, so that it can admit a small quill, a

* Atlantal portion, whose orifice leads towards the stomach.

† Orifice leading towards the stomach.

hollow tube of elastic gum is to be gradually introduced into the wound, until it penetrate into the superior * portion of the intestine, where it is as it were spontaneously directed, and by it a great quantity of fluid feculent matter will be discharged, with speedy alleviation of all the symptoms; then the fistula is to be dilated by prepared spunge, and is to be kept afterwards in this degree of dilatation, by means of the introduction of the tent of linen. And the ill-digested food and lumbrici arrested in the membranous *funnel*, are discharged by this large opening.

If however, on the supervention of dangerous and fatal symptoms, the fistulous tube is already so much contracted, as only to admit a fine grooved probe, the best plan which remains for the surgeon to adopt, is the laying open the whole fistulous tube as far as the membranous *funnel*; after this, if the feculent matter does not pass out completely, there may be occasion for the introduction of the tube of elastic gum, and the other usual means for effecting dilatation. This incision is not attended with great danger, provided it is performed by an experienced hand, and it does not require to be carried very deep, because the membranous *funnel* is not seated very deep under the cicatrix of the wound, and the small hole which always remains in the centre of

* Atlantal.

the cicatrix guides the fine probe precisely into the membranous passage, where the feculent matters are stopped. This kind of *gastrotomy* is very different from that which has been formerly proposed, whether we consider the motive which renders it necessary, or the mode of performing it; and it is the only one of this kind which deserves to be admitted among the operations of surgery, because it is supported on solid principles, and may be easily and safely performed.

With regard to which point, it is proper to relate here an example of the success of this operation performed by Renaud (*p*). A man, twenty-five years of age, had been affected with an inguinal hernia of the right side for three years. In the month of September, 1772, he was attacked by strangulation in the groin, with the most alarming symptoms. Renaud being called in, three days after the accident, found the patient in a state of general depression, with a small convulsive pulse, singultus and vomiting of stercoraceous matter, so that every thing prognosticated speedy dissolution. By means of the incision of the hernia, a fold of intestine was laid bare six or seven inches long, with a portion of omentum approaching to a state of gangrene, which was cut away without previously applying a ligature. Two hours after the replacement of the viscera in the

(*p*) Journal de médecine, juin 1787, p. 547.

abdomen, and the application of the dressings, the patient went to stool, and the following day, by the use of a purgative, the pains of the bowels ceased. A fortnight afterwards, every thing apparently going on well, the patient was again attacked with colic pains, and on removing the dressings, the wound was found covered with feculent matter and two worms. Renaud ordered an anthelmintic and a glyster to be used every other day. After twenty-three days, the discharge of feces by the wound was sensibly diminished. On the twenty-sixth day, a purgative evacuated the greater part of the excrements by the natural way, and the following days much more, so that on the thirty-sixth the wound was nearly healed. A month afterwards, the alvine excretions again became scanty and difficult, and a fixed pain arose in the right groin, with evident swelling above the cicatrix. Renaud found that this tumor was formed by a stoppage of the feculent matters, and after having employed, with no benefit, bleedings, emollient poultices and glysters, he resolved to make an incision into it, which was the more necessary and urgent, as there had been a return of the vomiting, with small pulse and cold sweats. The incision of the cicatrix and of the abdominal muscles, allowed an opportunity of penetrating into the tumid intestine with the point of the bistoury, *(or rather into the passage of communication between the two apertures of the intestine formed by*

the membranous funnel,) from which the fluid feculent matters were discharged with so violent a jet, as to extinguish a candle, and bespatter the operator from head to foot. The wound of the intestine, *(or of the membranous funnel,)* being sufficiently dilated, so as to admit the point of the finger, the operator was enabled, by this means, to extract a ball as large as a nut of indurated feculent matter, having a prune-stone as a nucleus, with seeds and skins of boiled apples. Two days after this operation the patient took a purgative, which produced its effect only by the wound. On the sixth day, the alvine excretions appeared, and those by the wound diminished. Another purgative directed the feces by the rectum more powerfully than the first. No other accident supervened, and the wound was again cicatrized on the twenty-first day.

§ 21. Another dangerous accident, produced by the premature and improper constriction of the artificial anus, is the infiltration of the feculent matters between the aponeurosis of the abdominal muscles, and especially between that of the *external* oblique and the common integuments of the groin, from which necessarily proceed numerous abscesses and fistulæ around the inguinal and iliac regions, which waste the strength of the patient, and conduct him to his grave, as will appear from the following case.

Francisco Ferrario, twenty years of age, was affected with a *congenital* inguinal hernia on the right side, which became incarcerated and mortified. The hernia was composed of omentum and intestine. The protruded portion of omentum was cut away by the surgeon, in the vicinity of the inguinal ring. The loop of intestine livid, but not yet gangrenous, was replaced over against the ring. The vomiting and hiccup ceased immediately after the operation, and two hours afterwards the patient had several black and very fetid stools. During the night of the third day, the alvine evacuations were suppressed, and the abdomen swelled. On the fourth day the livid portion of intestine replaced behind the ring burst, and although a ligature had not been passed through the mesentery in order to retain it in its place, the feculent matters passed out in great quantity by the wound, along with a large lumbricus. After that, the cure went on favourably till the twentieth day after the operation, at which period the wound had made rapid progress towards cicatrisation. Instead of the natural passage becoming more open, pains arose in the abdomen and in the vicinity of the crest of the right ilium, where afterwards an abscess formed, which on being opened discharged feculent matter mixed with pus. Not long after the patient was attacked by acute pain a little above* the pubes,

Atlantad of.

with swelling, on compressing which, the feces with purulent matter passed out * by the first fistula. An improper choice of food made the alvine evacuations be entirely suspended, and that gave occasion to a new abscess and fistula above the pubes, between which and the preceding ones some tubercles like *furunculi* arose in succession, and these having afterwards become black and gangrenous, discharged a great quantity of very fetid feculent matter. And it ought to be remarked, that from several of the fistulous apertures seeds of pears were discharged, of which the patient had eat a great quantity. Notwithstanding nourishing diet, and the uninterrupted use of strengthening remedies, the strength of the patient gradually failed, and he fell into a state of marasmus, and at last being attacked by violent fever, with cold shivering and most acute pain in the right trocanter, he died, after four months of constant sufferings.

On opening his body, I found that the two apertures of the intestine arranged in a line parallel to each other, were surrounded and compressed by the remains of the neck of the hernial sac. The base of the membranous *funnel* was short and contracted, and its apex on the outside† of the inguinal ring and just under ‡ the integuments, opened into a cavity capable of containing

* Peripherad. † Peripherad of. ‡ Centrad of.

a nut, from which cavity, blackish internally *, went out as many fistulous canals as there were apertures in the inguinal and iliac region, discharging feculent matter mixed with pus.

In this patient, it was a self evident fact, that the retraction of the neck of the hernial sac being inconsiderable, and therefore the capacity of the membranous *funnel* or passage of communication between the two divided portions of the intestine being small, the feces found a greater facility in being discharged by the wound than by the natural way. During the cure, the wound having suddenly become very contracted, the patient was exposed to two very great dangers, the one the rupture of the intestine above its attachment to the membranous *funnel*, the other the infiltration of the feculent matter between the abdominal muscles and the common integuments of the groin; which last took place. This accident might have been remedied by the surgeon, if, attending to the scantiness of the alvine evacuations, to the too quick contraction of the wound and to the tension of the abdomen on the appearance of the first feculent abscess, he had dilated in time the original fistulous canal with the knife, with the prepared spunge, or with both these means. This precept ought never to be neglected in similar circumstan-

* On its central aspect.

ces on the first appearance of the feculent abscess in the vicinity of the fistula or artificial anus.

§ 22. On comparing the operation of Ramdhor (*l*) with the simplicity and efficacy of the means which nature employs for re-establishing the continuity of the intestinal tube affected with gangrene in hernia, we cannot but acknowledge the superiority of the means used by nature, in comparison with those which have been suggested by art.

In the first place, the introduction of the upper* end of the intestine into the lower† is not practicable in a great number of cases of strangulated mortified hernia, on account of the strong adhesion which the sound portion of the intestine has contracted with the neck of the hernial sac, during the inflammatory stage of the strangulation; in the second place, because, even in those cases in which this adhesion does not exist, it is very rarely possible to draw out * as large a portion of the intestinal tube, as is requisite for performing the invagination accurately. Besides, the rough touching and handling of the viscera, the wounding and stretching of them produced by the ligatures, are causes of themselves alone sufficient to produce inflammation of the sound and introduced portion of the intestine, and render the operation of no

(*l*) Mœbius obs. med. miscellan. obs. XVIII.

* Atlantal. † Sacral. * Peripherad.

effect, or even fatal. To these causes of excessive irritation, modern surgeons have added in their experiments new stimuli; such as the introduction of a segment of the trachea of a calf, varnished paper, a piece of candle, or of isinglas, and other similar substances, to stitch upon them the intestine introduced into the lower portion, the presence of which substances, besides being an obstacle to the course of the feculent matter, carry the inflammation of the invaginated and sewed intestine to such a height, as to cause the death of the patients, amidst the most violent torments (*u*). The literary journals (*x*) mention various experiments made by Thomson of Edinburgh, and Smith of Philadelphia, on dogs, in order to demonstrate, that divided intestines may be sewed together, and returned into the abdomen, without endangering the life of the animal, without any fear of the ligatures falling into the cavity of the abdomen, which ligatures, by an unknown process of nature, are expelled along with the feces. No mention is there made of the manner in which these ligatures were practised, and in what manner the lips of the wounded intestine are placed in mutual contact; a very difficult point to be obtained even in dogs. Whatever be this

(*u*) Annales de lit. méd étrang. avril 1809, p. 326.

(*x*) See the experiment made on this subject by Boyer. Mémoires de la soc. de méd. de Paris, tom. I.

method of re-union, I doubt very much whether it be applicable, with hopes of success, to the case of intestine divided in hernia, in consequence of gangrene. Similar experiments, even when attended with success, prove nothing else, than that a great number of operations can be performed on animals with success, which are most frequently useless or fatal in man.

On the other hand, we see almost daily that nature, by her own powers, and with wonderful simplicity, effects mildly such sort of cures, preparing herself, to use the expression, for the process, by making the adhesion of the sound portion of the intestine to the neck of the hernial sac, precede the gangrene of the strangulated intestine; then, on the separation of the gangrened parts, by retracting towards the cavity of the abdomen the divided extremities of the intestine, together with the remains of the neck of the hernial sac, by means of this membranous *funnel*, it at first directs the feculent matter by the wound, then forms of it a passage or depot, within which the feculent matter, poured from the superior orifice * of the intestine, making a half circle, passes into its lower aperture †. For two or three cases of the fortunate event of Ramdhor's operation, there are now innumerable cases recorded of complete cures effected by nature, without the in-

* Orifice leading towards the stomach.

† Leading towards the rectum.

tervention of art; on which account, at the present day, those patients may be considered as fortunate, who, in such very urgent circumstances, fall into the hands of surgeons who have not the *mania* of operating, and are not too anxious to close the fecal fistula. Perhaps it may appear to some, that the opportunity for practising Ramdhor's operation, ought to present more particularly in cases of wounds of the abdomen, with prolapsus of intestine completely divided by the injury, or mortified from long exposure to the air. And indeed it would be desirable, that this or some other similar operation could be performed with hopes of success in these circumstances, because it is too well demonstrated by experience, that in similar cases, nature alone is not sufficient to re-establish the continuity of the intestinal tube, as she does after gangrened hernia. But I doubt very much, whether the operation of Ramdhor can be performed with confidence of success even in cases of wounds of the abdomen, with prolapsus of wounded or gangrened intestine, because in general, the instrument which has completely divided an intestine, has produced so great an injury to the abdomen and to the viscera, that there remains very little or no hope of saving the life of the patient. And in the case where the fold of intestine squeezed between the lips of the wound has mortified, as before the separation of the gangrened portion, the sound part has already con-

tracted adhesions with the internal * and external lips of the wound of the abdomen, and cannot be drawn outwards †, so far as to allow the invagination, this operation cannot be performed, unless we wish to expose the patient to dangers much greater than those of a perpetual artificial anus.

§ 23. I now proceed to make a few remarks on the subject of protruded and wounded intestine, and I have no hesitation in asserting, that even in the case of lateral or transverse wounds of the intestine, the sewing of it, in whatever manner it may be practised, will constantly be not only an improper and useless operation, but even dangerous and fatal. For, in whatever manner it be performed, the severe symptoms cannot be avoided, occasioned by the stitches, although few in number, and by the presence of the threads passed through the substance of a viscus such as the intestine, endowed with much vitality and exquisite sensibility, covered by the peritoneum very susceptible of inflammation, and disposed to propagate that inflammation rapidly to all the rest of the intestinal canal and abdominal viscera. The experience of many ages has too clearly demonstrated, that in the greater number of cases in which the suture of the protruded and wounded intestine has been practised, the patients have perished in a very short time amidst the most

* Central and peripheral. † Peripheral.

acute sufferings, and that the few who have escaped, owed their life to the punctures being quickly torn, and the expulsion of the threads by the wound along with the intestinal contents, which continued to flow for a longer or shorter time until the complete cicatrization of the wound (*s*).

Every surgeon skilled in practice, especially in great and crowded hospitals, has certainly had repeated opportunities of observing, that a wound of the colon in the right or left iliac region with discharge of feces, on the first symptoms of partial or general excitement being subdued, continues for a certain time to allow the feces to be discharged, then contracts and closes, and the excrementitious matters pass entirely by the rectum. This takes place, because the natural adhesion of the large intestine to the sides of the parietes of the abdomen opposes the effusion of the feces into the cavity of the abdomen, and because the largeness of the intestine, on the contracting and closing of the external * wound, does not oppose any obstacle to the descent of the excrementitious matter by the natural way. On which account, if, in a case of protruded and wounded small intestine, it was in the power of the surgeon, as it

(*s*) Mr. Travers mentions a case of protrusion of small intestine, with a wound large enough to admit the finger. The wound of the intestine was closed by an uninterrupted suture, and the external wound sewed; no bad symptoms supervened, and the patient was well in six weeks. *Loc. Cit.* p. 160.—T.

* Peripheral.

certainly is, by the combined assistance of art and nature, to replace it in the abdomen, so that the wound of the intestine be placed in firm contact and in an accurate direction with the internal* lips of the wound, there can be no doubt, that the injured portion of intestine would form adhesions in a short time with the peritoneum, and with the internal† lips of the wound of the abdomen; that the fluid intestinal matter would pass out by it for some time, and at last, as happens in a case of wound of the large intestine, on the external‡ wound contracting and cicatrising, the fecal matters would resume entirely their natural course. The difference of caliber between the small and large intestines, would not prevent the progress of the alimentary matters, which are in general quite fluid; and besides, we see that they pass after the cure of the artificial anus, in spite of the acute angle which the intestine forms with the wound, and although the intestine has suffered a considerable loss of substance. The patient at any rate would preserve his life, even although a perpetual fecal fistula should be the consequence.

Confiding in these principles, deduced from the comparison of penetrating wounds with injury of the large intestine, with the protrusion and wound of the small intestine, I admit the possibility of curing the latter without the assistance of sutures. Nor do I want examples of similar cures, among

* Central. † Central. ‡ Peripheral.

which I may mention a recent case of small intestine, protruded and perforated incautiously by a country surgeon, in the act of pushing it into the abdomen with the point of a spindle. In this patient, without the assistance of any suture or ligature passed through the mesentery, the wounded portion of intestine remained in contact with the peritoneum, in the direction of the internal * lips of the wound of the abdomen, from which the intestinal matters continued to pass for a long time, and then resumed their natural course, and allowed the external † wound to cicatrize. This young man at present enjoys the most perfect health, and does not complain of any inconvenience depending upon the wound he had met with, nor upon the interruption of the passage of the feculent matters along the canal of the small intestines.

The constant pressure exercised by the diaphragm and abdominal muscles on all the viscera of the abdomen, and principally on that portion of intestine which is opposite to the weakest point of the abdomen, in consequence of the wound, is the reason, that the portion of injured intestine, instead of retiring from the wound of the abdomen, has rather a tendency to insinuate itself into it, and successively to contract an adhesion with the lips of the wound. And if any timorous

* Central. † Peripheral.

surgeon was unwilling to venture to commit the whole work to nature, he might, I think, with impunity, pass a ligature through the mesentery opposite to the seat of the wound of the intestine, as is very frequently practised in a case of mortified hernia. Forty-eight hours are sufficient to allow the intestine to contract adhesions with the peritoneum, and with the internal* lips of the wound. After this time, the ligature passed through the mesentery may be withdrawn without any fear of the intestinal matters being effused into the cavity of the abdomen. In the mean time, nothing should be omitted which may contribute to allay the pain, to restrain the impetus of the circulation, and circumscribe the inflammation within the limits of the *adhesive* stage. The external† wound is to be kept open with the same precautions, and according to the same indications which have been established above with regard to the treatment of the artificial anus, taking care that the external‡ wound contracts only in proportion to the increase of the alvine discharge, and the diminution of the alimentary matter by the wound. On this subject it is proper to remark, that the conduct of the surgeon in the treatment of penetrating wounds of the abdomen, with protrusion and injury of the small intestine, ought to be quite different from that which he

* Central. † Peripheral. ‡ Peripheral.

ought to adhere to in the cure of penetrating wounds of the thorax with injury of the lungs. In these, physiology and experience teach us to close immediately the external* wound, and, as is said, *by the first intention;* to moderate the impetus of the circulation by repeated bleeding and by antiphlogistic remedies, in order that as little effusion of blood as possible may take place in the thorax, and if it is not possible to avoid a considerable effusion, that the quantity itself of blood interposed between the pleura and the lungs may contribute to keep the viscus at perfect rest, and concur in stopping the hemorrhage by means of the *thrombus*, and at the same time promote the union of the wound in the lungs. For, after effecting the cohesion of the divided substance of the lung, the effused blood is either in small quantity, and in progress of time is taken up by the absorbents, or it is in great quantity, and after the wound of the lungs is healed, it elevates the external cicatrix in form of a tumor, opens it again, and forms for itself a passage outwards† (*t*), or at last shows the necessity of a counter-opening in the lower‡ part of the thorax. The contrary of all this takes place in penetrating wounds of the abdomen, with prolapse and injury of the intestine. The most

* Peripheral. † Peripherad. ‡ Towards the sacral aspect.

(*t*) Petit, discours sur les maladies principales observées dans l'Hôtel-Dieu de Lyon pendant neuf années, pag. 299.

important circumstance for the preservation of the life of the patient, is the keeping open the external * wound of the abdomen, to allow a free exit to the fecal matters by it, and that the wounded intestine may be constantly retained by the action of the abdominal muscles and of the diaphragm directed towards the weakest point of the whole abdomen, and that it may contract in a short time adhesions with the peritoneum and with the internal† lips of the wound of the abdomen. After this there is no reason to dread any fatal effusion of irritating matters into the abdomen, and in proportion as the feces resume their natural course, the external ‡ wound may be permitted with impunity to contract and close completely.

§ 24. I shall conclude this memoir by relating a case (*u*) of rupture of intestine in an inguinal hernia, occasioned solely by a violent exertion; which I consider as a very rare accident, and deserving of being recorded for several other reasons.

Piziani, a soldier of the Italian legion, a young man twenty-six years of age, during a violent effort in drawing the chain of the draw-bridge of the fortress Longone, felt a hernia re-appear which

* Peripheral. † Central. ‡ Peripheral.

(*u*) Communicated to me by Monsieur Lavérine, chief surgeon of the French army.

he had had from his infancy in the right groin, and of which he had supposed himself cured for several years. The accident happened in the evening, and the patient was not conveyed to the hospital till the following morning. The scrotum was enormously distended. Its weight left no doubt with regard to the nature of the parts which it contained; nevertheless, the regular surface of the tumor, and a certain sound which it gave on being gently struck, made it be suspected that there was air contained in it mixed with a watery fluid. The inguinal ring appeared very little dilated, which rendered it difficult to understand how so great a volume of parts had passed through it. The patient did not complain of violent pain, and had slept a little. His pulse had a greater degree of fullness and strength than is usually met with in cases of incarcerated inguinal hernia. Vomiting had come on a few minutes after the accident, but had afterwards abated, and only left a slight nausea. There was suppression of urine, or rather an impediment to the excretion, on account of the great bulk of the tumor which compressed the urethra, and inclined the flow of it to the pubes. In this state of the case, it was thought needless to attempt the replacement of the viscera, and the treatment consisted in bleeding the patient, in covering the tumor with compresses dipped in the cold fomentation of Schmucker, and in making the patient

take an ounce of oil every two hours. These remedies were of no use, and therefore it was necessary to proceed to the operation two days after the accident.

On carrying the incision down * to the sac, and making a small aperture into its upper† part, a puff of air issued out, followed by a very copious stream of very fetid feculent matter, which clearly showed that the intestine had already burst, as the effusion of feces could not be regarded as a consequence of gangrene or sphacelus, which had not as yet taken place. The surgeon continued the incision through the whole length of the sac, and after having washed with tepid water the mass of protruded intestines, composed of colon and ileum, of the latter about four feet in length, he discovered distinctly the place of the rupture of the colon of a round shape, with the edges turned outwards ‡, through which aperture it might have been possible to introduce the point of the thumb. The testicle was bare, because the hernia was *congenital.* The surgeon could with difficulty divide the inguinal ring, on account of the bulk of the protruded viscera, and with still greater difficulty make the whole portion of small intestine pass again into the abdomen. He afterwards returned the colon, but before doing that, he passed a waxed thread through the lips of the rupture of the intes-

* Centrad. † Atlantal. ‡ Peripherad.

tine, in order to close it, and at the same time retain it opposite to the inguinal ring. After the operation, all those means were employed which art suggests, for promoting the natural course of the feces, but in vain. The abdomen became very much swelled and painful, the vomiting recurred, and the patient expired on the sixth day after the accident, and the fourth after the operation. On opening his body, it was found that the inflammation had extended to all the viscera of the abdomen; of the two portions of intestine that had descended in the hernia, the ileum was sphacellated, while the portion of colon had only been affected with that degree of inflammation necessary for favouring the attachment of the intestine to the peritoneum, behind * the inguinal ring. This adhesion had in fact begun, and the rupture of the colon had not removed from the place where it had been situated after its replacement. The testicle and spermatic cord were almost in a gangrenous state. Thus far I have related the fact, as it was transmitted to me.

From the circumstances of this case, since it appears that it was a congenital hernia, it may with probability be supposed, that, although the patient considered himself as perfectly cured, the vaginal coat still remained open towards the cavity of the abdomen, and in such a state as to be

* Centrad of.

again dilated by the viscera violently forced downwards; which accounts, likewise, for so enormous a mass of intestines having been able in a moment to descend from the groin to the bottom of the scrotum. With regard to the rupture of the colon, (perhaps the cæcum,) it is impossible, in my opinion, to assign with certainty the immediate cause of it, as this intestine preserved its proper caliber, and its coats had their natural consistence, nor was there any mark of gangrene or sphacelus, to which the proximate cause of this accident could be referred. On which point it appears to me merely probable, that in this man, at the moment of the violent exertion, the cæcum with the beginning of the colon had been crammed full with hardened excrements, and that these being forced through the narrow passage of the neck of the vaginal coat and of the inguinal ring, had lacerated the intestine. It is unfortunate with regard to this fact, that the operation was not performed immediately after the accident, but two days after the external * surface of the protruded intestines had been in contact with the effused feces, than which nothing is more apt to produce inflammation and gangrene of these viscera. And the operation ought the more to have been performed speedily, as it is well known, that in herniæ which return, the strangulation

* Peripheral.

produced by the neck of the hernial sac, or of the vaginal coat, is much more rapid, more violent, and dangerous than in ordinary cases. I could have wished likewise, that the waxed thread had not been passed through the lips of the fissure of the intestine to draw it together, and retain it behind * the ring, both because every kind of suture only increases the already excessive irritation of the intestinal canal, besides being unnecessary, and farther, because the natural course of the feces not being quickly re-established, the sewing is torn, or, by retarding the passage of the feces by the wound, it causes the abdomen to remain in a state of painful turgescence. While, on the contrary, allowing the free egress of the feculent matter by the rupture of the intestine, and by the wound, besides that this removes the tension of the abdomen, and allays the general symptoms, on the union of the intestine taking place opposite to the inguinal ring, on the gradual contraction of the wound, the capacity of the cæcum and of the colon present the greatest possible opportunity to the feces of abandoning the artificial anus, and taking their natural course, there being little or no loss of diameter of a large intestine in consequence of a simple rupture.

* Centrad of.

MEMOIR FIFTH.

OF UMBILICAL HERNIA, AND OF HERNIA OF THE LINEA ALBA OF THE ABDOMEN.

§ 1. Umbilical hernia, properly so called, or the hernia which protrudes precisely, and, in the strict acceptation of the word, from the aponeurotic aperture of the umbilicus, is a disease of infancy. This hernia at least, very rarely occurs in the adult, and the rarity of its occurrence renders it probable, that when it is met with in persons grown up and advanced in years, the commencement of the disease has passed unobserved in the infancy of these persons, in consequence of the small size of the tumor at that time, and the trifling inconvenience which it occasions. The same may be said of the *hydromphalos*, in consequence of ascites, and of the tumor formed by the urinary bladder, enormously distended from suppression of urine, and raised as far as the umbilical region.

In adult persons, and especially in women in the last stages of pregnancy, the hernia in most cases undoubtedly does not form at the umbilicus, properly speaking, but on the one or other side, above* or below the aponeurotic umbilical ring, and sometimes not only one, but even two herniæ appear in pregnant women in the vicinity of the umbilicus, neither of which passes out† by the proper umbilical ring (*a*). In general, likewise, in women who have had many children, the *linea alba* is found very broad, very thin and weakened in several places, but the umbilicus, properly so called, is very rarely observed dilated, in spite of the strong and repeated distention which the abdominal parietes suffer during the time of gestation; which proves that in persons well formed from infancy, the umbilical ring, far from being the weakest part, is rather the firmest and most resistant of the whole tract of the *linea alba*.

§ 2. The umbilical ring in infants, before the separation of the umbilical cord, and before the consequent cicatrix has acquired a due degree of solidity, opposes less resistance to the impulse of the viscera than any other part of the aponeurosis of the *linea alba*. On the contrary, as soon as the cicatrix of the umbilicus is perfectly consolidated,

* Atlantad or sacrad of. † Peripherad.

(*a*) Monteggia, Instit. chirurg. part III. sez. II. § 659.

the umbilicus properly so called, becomes the point of greatest resistance to the succussion of the viscera in comparison with any other place of the tendinous line, and of the other aponeurotic apertures of the abdomen. In the embryo of two months, the abdominal muscles, and especially the rectus, have the appearance of a yellowish mucus, and it is not till the fourth month that these muscles assume a fibrous form from the umbilicus to the pubes; as from the umbilicus to the sternum they still remain mucous and pale, so that they can with difficulty be distinguished from the neighbouring parts. They are besides at this place very much separated from each other, on account of the great distention produced by the large lobe of the liver, in the superior * part of the abdomen, and particularly in the umbilical region, where the abdominal viscera only seem to be retained by the peritoneum, protruding in the root of the funiculus. In the fetus, in proportion as the developement of the abdominal muscles is completed, and their aponeuroses acquire greater density and consistence, the centre of their union in the *linea alba* and umbilical aperture becomes depressed, and the fulness of the peritoneum in the umbilical region sinks and recedes towards the cavity of the abdomen. However, in the dead body of a fetus of the seventh month, on

* Atlantal.

passing the point of the finger within the cavity of the abdomen along the *linea alba*, when it reaches the region of the umbilicus, that place is evidently felt to be the least resistant of any other of that aponeurosis, and on compressing the centre of the umbilicus with the point of the finger, or with the blunt end of a large probe, the one or other is readily insinuated into the umbilical ring, and forces the peritoneum before it; and if at the same time the cord be drawn gently outwards *, a small fossa like a *funnel* is formed in the umbilical ring, on the side † of the cavity of the abdomen, not unlike an incipient hernial sac. In these tender fetuses, in separating the peritoneum from the vicinity of the umbilicus, the subjacent cellular substance, which ties the umbilical vessels and urachus together, and connects them to the aponeurotic margin of the umbilical ring, is observed to be very weak, and very extensible, so that on drawing the cord even slightly outwards ‡, the umbilical vessels within § the abdomen are perceived to be elongated from || within outwards, and to yield readily to the force which draws them out ¶ at the umbilicus. The margin likewise of the aponeurotic ring of the umbilicus, is more thin and yielding than the rest of the apo-

* Peripherad. † Centrad. ‡ Peripherad. § Centrad of.

|| From the central towards the peripheral aspect.

¶ Peripherad.

neurosis of the *linea alba*. All these circumstances, conjoined with this weak cellular union of the aponeurotic margin of the ring with the umbilical vessels, appear formed expressly by nature, that, during the evolution and complete increase of the fetus, the umbilical vessels should not meet with any obstacle to their greatest dilatation in that passage, and that there should be no impediment or stricture to oppose the free nrance and return of the blood from the placenta, and from it to the fetus.

§ 3. In the body of an infant, about two months after the complete cicatrisation of the umbilicus, an arrangement of parts is found quite the contrary of the above mentioned. For, on passing the point of the finger along the *linea alba*, on the inner * side of the abdomen, a small fossa no longer presents itself opposite to the umbilicus, but a small tubercle which resists the pressure: and on separating the peritoneum from the muscular parietes of the abdomen in the umbilical region, as soon as we reach this tubercle, the peritoneum is found very firmly adhering to it, and at the same time to all that which constituted the fasciculus of the umbilical vessels in the fetus. Behind † the peritoneum, the cellular substance surrounding the remains of the umbilical vessels,

* Central aspect. † Peripheral of.

converted into as many ligaments, and uniting them to the aponeurotic margin of the ring, is very firm and compact, and as it were intermixed with strips and hard aponeurotic filaments, in consequence of which, the tubercle or knot composed of peritoneum and the divided umbilical vessels, can with difficulty be removed from the aponeurotic margin of the umbilical opening, whether it be drawn * towards the abdomen or outwards. The divided extremities of the umbilical vessels, which have already become shrivelled and impervious, and pressed firmly together by the dense cellular substance, are fixed in the margin of the umbilicus, and are confounded with the cicatrix of the integuments, which has a greater thickness and hardness than that of the neighbouring skin. In process of time, this cicatrix becomes always deeper, and comes in contact with the aponeurotic umbilical ring, which arises partly from the farther retraction of the umbilical ligaments, and of the cellular substance twisting them together, partly from the increasing puckering of the cicatrix, and the greater quantity of fat which collects round it, and elevates the surrounding parts.

§ 4. The umbilical opening, therefore, in the infant two months after birth, and still more in

* Centrad or peripherad.

the adult, is not only like the other natural openings of the abdomen, strengthened internally* by the application of the peritoneum, and of the cellular substance, and on the† outside by the common integuments, but it is likewise plugged up in the centre by the three umbilical ligaments, and by the urachus; these ligaments form a triangle, the apex of which is fixed in the cicatrix of the integuments of the umbilicus, the base in the liver, in the two ileo-lumbar regions, and in the fundus of the urinary bladder; by this triangle, is formed a strong and elastic bridle, capable of itself alone of opposing a powerful resistance to the viscera attempting to open a passage through the aponeurotic ring of the umbilicus, which apparatus does not exist at all at the inguinal ring or femoral arch. To these securities, it may be added, that the thin and weak margin of the umbilical ring in the fetus of seven months, acquires a considerable density and elasticity in the infant two months after birth, and that at this period, and still more in the adult, the aponeurotic edge of the aperture, more contracted in proportion than in the fetus, is firmly applied to the cut extremities of the umbilical vessels converted into ligaments. From these circumstances, it is easy to prove, that the danger of the formation of umbilical hernia diminishes, the nearer the fetus ap-

* On the central aspect. † Peripheral aspect.

proaches to maturity, and in the infant the more it increases in age, unless causes intervene capable of disturbing the operations of nature, of which causes, as shall be mentioned, some exercise their hurtful influence during the course of gestation, others a little after the fetus has been brought into the world. During gestation, there is a singular contrast between the phenomena which occur in the male at the umbilical ring, and those at the inguinal ring; since the umbilicus has a constant tendency to contract, the nearer the pregnancy approaches to its termination, while the inguinal ring, during this time, gradually enlarges more and more, to allow at last a passage to the testicle, to the developement of the spermatic vessels, and to the cremaster muscle.

§ 5. If we consider the period at which umbilical hernia occurs, it may be divided into two species, the *congenital* and *adventitious*. The *congenital* hernia, or that which forms before birth, opens itself a way through the umbilicus, and then extends and increases in the spungy substance of the umbilical cord. There is no determinate time in the course of gestation, for the appearance of this disease, as it is met with in the embryo(*b*), in the immature fetus(*c*), and in the fetus at the full

(*b*) Plate XIV. fig. 1. (*c*) Pl. XIII. fig. 1.

time(*d*). This species of hernia has a singular appearance, as it is opaque(*e*) for a certain space from its base, where it is covered by the integuments of the abdomen; while, in the remaining part, or towards its apex, it is pellucid (*f*), where it is enclosed in the spungy substance of the umbilical cord, from which place the cord seems to be detached and to derive its origin(*g*). The transparency of the external covering of the tumor allows us to see that the hernial sac has opened for itself a passage outwards* in the triangular space between the vessels of the umbilical cord, of which the vein(*h*) is at the upper† part, the two arteries below ‡ or on one side (*i*); for the hernia having penetrated into the substance of the cord, pushes the two arteries on the same side, or the one only, if by chance it wants its fellow, as in the annexed plate(*k*). The hernia in the space which it occupies within the root of the umbilical cord, is covered by two distinct coverings, the ex-

(*d*) Pl. XIV. fig. 2.
(*e*) Pl. XIII. fig. 1. a. a.
(*f*) Pl. XIII. fig. 1. b. b.
(*g*) Id. fig. 1. h.
(*h*) Id. fig 1. e. e.
(*i*) Id. fig. 1. f.

(*k*) Pl. XIV. fig. 2. d. e. Pl. XIII. fig. 1. f.—I remarked that this artery was larger than usual. The occasional deficiency of one of the umbilical arteries has been noticed by Bavinus, *Theat. anat.* Lib. I. cap. XI. by Hebenstreit, *Pathol. funiculi umbilicalis,* pag. 13; by Roederer, *Dissert. de fœtu perfecto;* by Haller, *Opusc. pathol.* obs. XXXIV.; by Wrisberg, *Descriptio anat. embrionis,* obs. IV. p. 51.

* Peripherad. † Atlantal. ‡ Sacrad.

ternal * of which is formed, as has been said, by the pellucid spungy substance of the cord, the internal † by the peritoneum elongated in the manner of a hernial sac. The first (*l*), on account of its transparency, seems very thin, but on examining it attentively, it is of a firm and coriaceous texture, and appears to be rather a continuation of the skin of the abdomen, than of the thin and flaccid membranes of the placenta. And this analogy of texture is rendered still more manifest or probable, if the umbilical cord is macerated for a long time along with the skin of the abdomen, with which it is connected; as the skin, swelled out by the water penetrating into its relaxed layers, assumes a transparency very analogous to that of the substance surrounding the umbilical cord. The second covering (*m*) of the hernia is, properly speaking, the hernial sac formed by the peritoneum, within ‡ which the protruded viscera are situated; a thin membrane indeed, but as consistent and elastic as the rest of the peritoneum lining the cavity of the abdomen. Between these two coverings, a small quantity of mucilage is found, resembling *albumen*.

The hernial sac contains sometimes a knuckle of small intestines (*n*), sometimes a prominence

* Peripheral. † Central. ‡ Centrad of.

(*l*) Pl. XIII. fig. 1. b. b. (*m*) Id. fig. 1. c. c.

(*n*) Pl. XIV. fig. 1. b. fig. 2. b.

formed by the liver(*o*), sometimes in the largest herniæ of this species, the liver, the spleen, and a portion of small or large intestine. In the fetus from which I have taken fig 1. of PLATE XIII. the viscus contained in the *congenital* umbilical hernia, was a portion of the large lobe of the liver, which extended in the form of a cone through the umbilicus within the root of the cord. It was not, properly speaking, that the whole mass of the liver had been separated from its strong adhesion with the diaphragm; it appears impossible that that should ever take place, but it was that portion only of the turgid and large viscus opposite to the umbilicus, which had been forced through the opening. This can only happen at the early period of life, at which the liver, of itself alone filling the greater part of the cavity of the abdomen, extends as far as the umbilicus. In the other fetus(*p*), there was a considerable portion of the *jejunum* rolled up and adhering to the peritoneum at the entrance of the hernial sac. Mery(*q*) and Ruysch(*r*), have given a plate representing this *congenital* umbilical hernia. The first of these writers thought that this tumor had no hernial sac derived from the peritoneum, and that the double transparent membrane by which the protruded

(*o*) Pl. XIII. fig. 1. b. (*p*) Plate XIV. fig. 2. b.

(*q*) Mémoires de l'acad. royale des sciences de Paris, an 1716.

(*r*) Observ. anatom. chirurg. obs. 71. fig. 59.

viscera were surrounded, was only a continuation of the membranes, *corion* and *amnios*. Ruysch merely said, that in similar *congenital* diseases in the umbilical region, and more precisely at the umbilicus, the abdominal muscles, and also the skin were wanting, and that that place was only covered by a very thin skin, through which the viscera were seen; which is false. Farther, neither the one nor the other of these authors mentioned what position and direction the umbilical vessels included in the hernia assumed in such circumstances, as we have taken an opportunity of pointing out, both with regard to the vein and the two arteries.

§ 6. The fetuses which are born with this disease, in general, only survive a short time, both because they are affected for the most part with other very great imperfections, such as *spina bifida*, with incomplete developement of the bones of the head, weakness of the abdominal muscles, enormous swelling of the abdominal viscera, especially of the liver, and because the viscera protruded in the umbilical hernia, on account of the firm adhesion contracted by them to the hernial sac, or of the obstacle opposed by the other enlarged viscera, are not susceptible of complete reposition (*s*) in most cases. The principal cause of

(*s*) Ruisch, loc. cit. Hunc effectum sæpius a me visum, ast nunquam curatum memini. Omnes enim ab utero ad tumu-

this congenital disease, is probably owing to the slow and incomplete developement and increase of the abdominal muscles, and of their aponeuroses, conjoined with the enormous swelling(*t*) of the viscera of the abdomen, and of the liver in particular, in consequence of which, the umbilical ring in the embryo, and in the immature fetus, being already naturally the weakest point of the whole *linea alba*, the viscera are carried towards this point as the least resistant of any other, and still weaker than in the natural state; they then form a protuberance in the umbilical region, and at last open themselves a passage through the umbilicus into the spungy substance of the cord. To these causes may perhaps be sometimes added the shortness and permanent tension of the umbilical cord twisted round the neck or any other part of the fetus, for, as I have demonstrated above, on drawing the cord even slightly outwards* in the embryo, the peritoneum forms within the opening towards the cavity of the abdomen a small fossa, not unlike the beginning of a hernial sac,

lum delati fuere 5, 6, 7, 8, aut 9 die. Cura palliativa instituenda solo emplastro diapompholigos, aut simili, quod nullam obtinet tenacitatem, ne nimis parti teneræ adherens viscerum eruptioni occasionem præbeat.

(*t*) Albinus, Acad. anot. Lib. I. cap. XIX. Venter omnibus tumidulus umbilicum versus emineus.

*Peripherad.

which invites, to use the expression, the viscera to protrude. This unfortunate derangement of parts existing, a long and laborious labour may contribute, if not, properly speaking, to produce the disease, at least to increase it enormously. In fact, it is precisely in consequence of difficult and laborious labours that those fetuses have been born, in which the liver, spleen, stomach, and a part of the small intestinal canal have been found accumulated within a large umbilical hernia.

§ 7. The *adventitious* umbilical hernia, or that which makes its appearance in infants after the separation of the umbilical cord, presents the following peculiarities. The tumor has sometimes a round, sometimes a cylindrical shape, sometimes it is conical, with a circular base. There does not appear on it any mark of the cicatrix of the umbilicus, if we except on its apex, or on one side of the tumor, where a colourless portion of the integuments is thinner than the rest of the skin covering it. Under* the common integuments a sheath presents itself (*u*), formed by the cellular substance, and by the thin aponeurotic web extending superficially over the muscles of the abdomen. Immediately after this membrano-aponeurotic sheath, the hernial sac, properly so called, appears (*x*),

* Centrad of.

(*u*) Plate XIII. fig. 2. a. a. a. a. (*x*) Id. fig. 2. b. b.

formed by the peritoneum, which preserves its natural thinness in this as well as in other herniæ. The loop of intestine is contained in this sac(*y*); the omentum is never, or almost never found in it. The divided extremities of the umbilical vessels, converted into as many ligaments, retain their natural position in small herniæ of this species; in large herniæ they are found pushed to the one or other side, and do not present, as in the healthy state, the close connection with the cicatrix of the umbilicus, and can only be traced for a few lines without* its aponeurotic margin, and show no other mark of their original union with the integuments of the umbilicus, but a few filaments stretched over† the hernial sac. There is always a hernial sac whether the umbilical hernia be recent and small, or of long standing and large. If it has appeared to some writers, that old herniæ of this species had no sac formed by the peritoneum, and to others, that the peritoneum had been lacerated (*z*) by the impulse of the viscera, the deception has proceeded from not having employed all that care which is requisite in investigating the subject, and especially those places of the tumor at

(*y*) Pl. XIII. fig. 2. c. c.

(*z*) Richter, Anfangsgründe der W. A. Kunst, V. Band. § 537.

* Peripherad of.

† Peripherad of.

which the viscera had become adherent to the sac. I have always met with it even in umbilical hernia of the largest size, and I have discovered it likewise in those places at which it seemed to form one uniform mass with the viscera adhering to it (*a*), viz. on the most dependent and prominent part of the hernia, where the adhesion is in general stronger than any where else, on account of the weight of the protruded viscera, and the pressure exercised by the clothes on it.

The neck of the sac of umbilical hernia is always short and of a circular figure. It is, farther, always narrow in proportion to the bulk of the hernia, and besides that, firmly adhering to the aponeurotic margin of the umbilical opening; which margin, in large and old umbilical hernia, acquires a considerable thickness and rigidity, in consequence of which, on trying, in many cases, on the dead body, to make the dilatation of it by means of the dilator of Leblanc, I have always met with a very powerful resistance.

In general, we only find a portion of intestine in umbilical hernia, as the omentum is very short in infants. In adults, both of these viscera are protruded. Sometimes the intestine protruded is a portion of the *transverse* colon. The cæcum has also been found in it (*b*), within which the hardened feces could be distinguished by the

(*a*) Plate XIV. fig. 4. a. a. a. (*b*) Sandifort, Observ. patholog.

touch. In adults, the omentum having passed out* in umbilical hernia, is not unfrequently unusually spread out, and thickened at the lowest † part of the tumor; at other times it forms a sort of capsule, within which the intestine is contained (*c*). In general, in old and large hernia of this species, the omentum contracs adhesions for a great space to the hernial sac, which prevent its return; and if unfortunately this species of hernia is attacked by strangulation, it is impossible in that case to lay bare the intestine without dividing the omentum which incloses it. And if, in the act of operating, it is intestine which presents itself before the omentum, it may with certainty be asserted, that the intestine, during a previous violent exertion, has lacerated the capsule of the omentum within which it was contained, and that it was only covered by it. Arnaud (*d*), guided by long experience, was induced to believe that this accident was one of the most frequent causes of strangulation in umbilical hernia of adults (*e*). Howsoever this may be, if we pay at-

* Peripherad. † Most sacral.

(*c*) Plate XIV. fig. 4. d.

(*d*) Mémoires de chirurg. tom II. pag. 586.

(*e*) A case of this kind was communicated to me by my friend Dr. Abercrombie, in which the omentum strangulated the intestine. The patient, a woman about fifty, had been affected with an irreducible umbilical hernia for fourteen years.

tention to the great difference which always exists between the size of this hernia, and the narrowness of its neck, we cannot fail in that to recognize a constant and evident cause, why the umbilical hernia, when neglected, becomes habitually troublesome to the patient, from the difficulty which the flatus and alimentary matters meet with in entering the tumor, and in returning into the abdomen through the narrow aperture of the neck of the hernia. This difficulty, however little

It became strangulated, and the operation was obliged to be performed. As the hernia was irreducible, the sac was not opened, but the stricture at the umbilicus, which was nearly as thick as the point of the little finger and almost cartilaginous, was freely divided. The patient went on very well for four days, when the vomiting returned, and she died on the seventh day after the operation. On dissection, the stricture at the umbilicus was found to have been completely removed. On laying open the hernia, nothing presented but a mass of omentum, in some places inflamed, in others partially suppurated. "On cutting into it, it was found to form a sac, in "which was contained a small turn of the ileum strangulated "and gangrenous. The stricture was produced by the neck of "this sac of omentum, which formed a ring nearly as thick and "as firm as the umbilical ring, which had been divided in the "operation. The intestine adhered to the omentum in several "places." Dr. Abercrombie farther remarked, that the neck of this sac was more internal than the umbilical ring, "lying "not in the hernia, but in the cavity of the abdomen, having "probably receded into that position when the tumor diminished in size, after the division of the umbilical stricture." —T.

it may be increased in consequence of accumulation of feces, or of air within the tumor, or of spasm of the intestinal canal situated in the abdomen, may induce strangulation. We may add, that the vicinity of the umbilical hernia to the stomach, contributes very much to render the consentient symptoms more frequent and troublesome, than what is commonly observed in inguinal or femoral hernia.

Besides the intestines, there is a very well authenticated case, that even the urinary bladder, when there has been an obstruction to the natural passage of the excretion of the urine, has been raised so* high in the abdomen, as to form a hernia through the umbilical ring, and afterwards open externally†, occasioning a urinary fistula. This fact is related by Cabrolius in his xx case. He writes, that in a female infant, born with the external‡ orifice of the urethra closed by a membrane, an umbilical hernia formed, and afterwards a urinary fistula at the same place. The girl having reached the age of eighteen, the umbilicus protruded for about four inches. An incision was made in the above mentioned membrane, which was as thick as a *testone (f)*, and a canula introduced into the bladder by the urethra, by means of which the urine took its natural course,

* Atlantad. † Peripherad. ‡ Peripheral.

(*f*) An Italian coin about the thickness of a three shilling Bank token.—*T.*

the fistula closed, and the tumor at the umbilicus disappeared. In this case, as in the hernia of the urinary bladder, which has descended into the scrotum, the protruded viscus was undoubtedly unprovided with a hernial sac proceeding from the peritoneum.

§ 8. The appearance of the *adventitious* umbilical hernia in children, is the result of the combination of several unfavourable circumstances. In the first place, we may reckon, during the last period of gestation, the slowness of the contraction of the aponeurotic ring of the umbilicus; the difficult labour from the excessive bulk of the abdomen of the fetus; the weak cohesion, for some time after birth, of the divided extremities of the vessels of the cord, with the cicatrix of the umbilicus, and with the aponeurotic margin of the ring; the weakness of the integuments composing the cicatrix of the umbilicus; the permanent tumescence of the abdomen for some time after birth. If, when these circumstances exist, the midwife does not attend to the keeping a convenient compress, and for a proper time, on the umbilicus, after the separation of the cord, the continual cries and exertions of the infant, harrassed with colics, and the improper custom of squeezing them with swaddling clothes, are causes sufficient to account for the abdominal viscera forced towards the umbilicus, as the weakest point of the abdomen in these cases, separating the cicatrix of the

integuments from its union with the cut extremities of the umbilical vessels, and distending it so as to cover the hernia, destroying every appearance of puckering and of cicatrix.

§ 9. In the greater number of cases of *adventitious* umbilical hernia, the hernial sac insinuates itself into the triangular space between the three umbilical ligaments, and pushes forwards * their point of union with the cicatrix of the integuments. In large herniæ of this species, however, the ligamentous fringes, formerly the umbilical arteries, are not unfrequently found applied over one side of the hernial sac. In some rare cases, the point of union of the umbilical ligaments with the cicatrix of the skin, only yields irregularly to the impulse of the viscera; in this case the umbilical hernia assumes a singular appearance, it is round at its base, flat at the point, and knotty at the sides. In dissecting one of these herniæ, I found that its aperture towards the abdomen (*g*) was circular, and that the body of the tumor was internally divided into three compartments (*h*), probably formed by the cut extremities of the umbilical ligaments. These receptacles communicated with each other; in one of them was found a small portion of intestine, in the other two a very small bit of omentum.

* Dermad.

(*g*) Plate XIV. fig. 3. b. (*h*) Id. fig. 3. d. e. f.

§ 10 The hernia of the *linea alba* very frequently forms so near to the aponeurotic margin of the umbilical ring, that it has been supposed by surgeons in general, to be a true umbilical hernia. In other cases, this hernia appears above* or below the umbilicus. The first, however, or that above† the umbilicus, is more frequent than the second, on account, as I suppose, of the *linea alba* from the *ensiform* cartilage to the umbilicus being naturally broader and less resistant than the other portion of the same aponeurosis extending from the umbilicus to the pubes, because the recti muscles, as they descend, converge towards each other. The superior‡ portion of the *linea alba*, is undoubtedly that which yields more than the inferior§ portion to the impulse of the uterus and of the abdominal viscera pushed towards the diaphragm; and in those who have had many children, if we examine carefully the superior‖ portion of this aponeurosis, and place it opposite to the light, it is found to be irregular, thin in some places, and transparent, in others wasted and disposed to separate longitudinally or transversely. And, in herniæ of this species, a fissure in the *linea alba* is constantly met with, sometimes longitudinal, sometimes transverse, through which the hernial sac has protruded, containing the intestine and omentum, or more commonly omen-

* Atlantad or sacrad of. † Atlantad of. ‡ Atlantal.
§ Sacral. ‖ Atlantal.

tum only. Some persons are so predisposed to this disease, from the tendency which the *linea alba* has to separate, that several herniæ have been observed to appear in them in the portion of this aponeurosis from the ensiform cartilage to the umbilicus. Nor can it be supposed, that in those individuals in whom a similar predisposition exists, that a great impulse of the viscera is necessary to produce this disease, as there are examples of the fat alone, accumulated and indurated behind* the peritoneum, in circumstances similar to the preceding, having made its way through the *linea alba*, and forming tumors externally† in this aponeurosis not unlike omental herniæ. That small hernia likewise, which was said to be formed by the stomach, with regard to which so much has been said and written by Garengeot and Hoin, without either the one or other, as far as I know, having produced a single fact proved by the dissection of the dead body, in my opinion, is not a disease in which the stomach is affected exclusively of any other of the viscera contiguous to it, especially the omentum and *transverse* colon. And this disease, it appears to me, only differs from other herniæ of the *linea alba*, by being situated on the left side of the ensiform cartilage, and on account of its great vicinity to the stomach, whatever be the viscus protruded, it in-

* Peripherad of.

† Peripherad.

duces consentient symptoms of the stomach more frequent and troublesome than those occasioned by other similar herniæ situated at the umbilicus, or between this point and the pubes, which is as much as to say, at a greater distance from the stomach.

§ 11. The hernia of the *linea alba* has constantly a flattened oval shape. Below* the common integuments, it is covered by a firm cellular substance, and by the aponeurotic web spread superficially† over the muscles of the abdomen (*i*). The hernial sac formed by the peritoneum then presents itself (*k*), and within‡ it are found the intestine and omentum, or in most cases, the omentum only, having a thin pedicle at the place of its passage out of the abdomen. The neck of the sac is likewise of an oval shape, similar to the fissure of the *linea alba* through which it has passed (*l*), and it is always narrow in comparison with the bulk of the tumor. In herniæ of this kind, about the size of a large apple, which I have examined in the dead body, the aperture of the neck of the sac towards the abdomen, did not exceed seven lines at its greatest diameter.

* Centrad of. † Peripherad. ‡ Centrad of.

(*i*) Plate XIV. fig. 3. g. (*k*) Id. fig. 3. h.

(*l*) Id. fig. 3. f.

§ 12. From the consideration of these observations, are derived the distinctive characters of the umbilical hernia, properly so called, and of that which forms at the *linea alba* in the vicinity of the aponeurotic margin of the umbilical ring. For, the umbilical hernia in the infant or adult, has always a round neck or pedicle, around which the aponeurotic margin of the umbilical aperture may be felt with the point of the finger. The body of the hernia constantly retains its spherical shape, even when of its greatest size. No puckering of the integuments similar to what is called the cicatrix of the umbilicus, is perceptible on the upper* part or side of the tumor, and there is only at one place a portion of the skin, which is observed to be a little paler and thinner than the rest of the skin covering the tumor. On the contrary, the hernia of the *linea alba* which forms in the vicinity of the umbilical ring, has a neck or pedicle of an oval shape, and the body of the tumor is always of an oval figure. Farther, on examining deeply with the point of the finger around the neck of the hernia of the *linea alba*, the margin of the fissure of the aponeurosis is felt to be very little or not at all elevated, and if it has formed very near to the umbilical ring, the cicatrix of the integuments of the umbilicus is seen still unchanged and wrinkled on the one or

* Atlantal.

other side of the tumor, a certain mark that the viscera have not passed out through that opening.

§ 13. I have mentioned above, that sometimes a small mass of indurated fat, situated between the peritoneum and its union with the aponeuroses of the abdominal muscles, makes its way insensibly through the separated fibres of the *linea alba*, and is at last elevated externally* in form of a tumor, which seems to have all the characters of an omental hernia. Petit(*m*) has called in question this fact of surgical pathology: *Pour moi*, he writes, *je n'ai jamais vu cette hernie. Selon les auteurs c'est une tumeur graisseuse qui paroit à la partie supérieure de la ligne blanche au coté droit du cartilage xiphoïde. La graisse qui la forme est, à ce que disent ceux qui l'ont vue, une augmentation de la membrane adipeuse et cellulaire qui accompagne la veine ombilicale devenant le ligament du foie.* The existence of this species of tumor through the *linea alba*, is not only a certain fact, and demonstrated by several observations made on the dead body by Morgagni (*n*), by Klinkosch (*o*), and several others, but it is also proved that it makes its appearance also in other points of the *linea*

* Peripherad.

(*m*) Œuvres posthumes, tom. II. pag. 215.

(*n*) De sed. et caus. morb. epist. 43. 10. epist. 50. 24.

(*o*) Dissert. med. select. Pragenses, v. 1. pag. 189.

alba, besides that to which the umbilical vein corresponds internally*. I had an opportunity of observing two of these tumors in the dead body of a man fifty years of age, of a slender make and much emaciated, one of which was situated immediately below† the *ensiform* cartilage, the other about two inches above ‡ the umbilicus. The first was as large as a small nut, and the second was equal to a large pigeon's egg. I supposed at first, that I had under examination two omental herniæ of the *linea alba* in the same subject, but on dissecting these tumors, I found that there was no hernial sac in either of them, and that they did not contain any omentum, but a hard fatty substance, which continued into a flattened pedicle passed through a fissure of the *linea alba*, and terminated on the external§ surface of the great sac of the peritoneum. The fatty pedicle of the lower‖ tumor was in fact a continuation of the fat which surrounded the umbilical ligament of the liver. Fardeau (*p*) lately communicated a case very similar to this to the Medical Society of Paris.

In consequence of farther researches on this subject, it appeared to me that I observed in these tumors a degree of density and hardness to the

* On the central aspect. † Sacrad of.
‡ Atlantad of. § Peripheral. ‖ More sacral.
(*p*) Recueil de la Soc. de Méd. tom. XVIII.

touch much greater than that presented by small omental hernia of the *linea alba.* Nevertheless, when the parts contained in a hernia do not pass into the abdomen, in the recumbent posture, or on the application of a moderate pressure, and remain constantly protruded, as they often do, if they are not painful, and do not produce any sympathetic affection of the stomach, I consider it as a very difficult thing to distinguish by the touch one of these tumors from a small omental hernia of the *linea alba.* This species of tumor fortunately does not occasion pain nor inconvenience on account of its bulk. The case however may occur, that a person, in whom a similar small tumor has existed for a long time in the course of the *linea alba,* may be attacked from a quite different cause by violent intestinal colic, with nausea, inclination to vomit, and interruption of the alvine excretions. The surgeon in similar circumstances, is easily led into error, presuming that the tumor is a true incarcerated hernia of the *linea alba,* subjecting the patient to an operation which has no connection with the cause of his disease. I myself fell into this mistake. A few years ago, a woman about fifty-five years of age, was brought into this school of practical surgery, rather fat, but of a weak habit, and habitually hysterical, who in the preceding night had been attacked by very violent intestinal colic, in consequence, as was said, of an incarcerated hernia. Her abdomen

was very tense and painful to the touch, the lower* extremities were cold, the pulse small, with nausea, inclination to vomit, suppression of stools. A little below† the umbilicus towards the left side of the *linea alba*, there was a small tumor about the size of a large nut, of the natural colour of the skin. The patient said that she had been repeatedly subject to pains of the abdomen, but never so violent as those she then suffered; which she ascribed to the abuse of ill-boiled pulse and farinaceous food. It appeared besides, and these illusions are not unfrequent in patients afflicted with violent pains, that the tumor, since the attack of the colic, had become manifestly larger than usual, and painful, which it was not before. Persuaded therefore, that this tumor was a true incarcerated hernia of the *linea alba*, conscious that these herniæ, like the umbilical, are most prone to pass into gangrene, I proceeded immediately to the operation. Having laid open the integuments, I did not find the least vestige of hernial sac. The contents of the tumor were a small mass of hard fat continued into a pedicle, which evidently passed through the *linea alba*, and was removed by a stroke of the knife. I then ascertained the true nature of the disease. The general tepid bath, repeated emollient glysters, fomentations, and the use of castor oil by the

* Sacral. † Sacrad of.

mouth in small doses, procured alvine evacuations, and the colic disappeared in a short time. The small wound was not long of healing.

§ 14. The distinction into umbilical hernia, and into that of the *linea alba*, is not without utility in practice. For that of the *linea alba*, although left to itself, increases more slowly than that at the umbilicus. The hernia of the *linea alba*, and more particularly that which forms on one side of the ensiform cartilage, precisely from its smallness, passes often unobserved, especially in very fat persons; and in the mean time, it occasions uneasiness of stomach, habitual colics, especially after meals, and these symptoms are attributed by the physician little versed in similar cases, unfortunately for the patient, to a quite different cause from the true one. The umbilical hernia, on the contrary, however small it is, and even at its very commencement in infants, becomes immediately manifest from the evident change which it produces in the cicatrix of the umbilicus, and by the rapid progress of the tumor. And with regard to the treatment, although the curative means are the same in both of these herniæ, yet that of the *linea alba* is more difficult of cure than the umbilical in similar circumstances, probably on account of the aponeurotic ring of the umbilicus having a natural tendency to contract, on the viscera being kept constantly replac-

ed; this contraction is not equally easily obtained in the edges of the fissure of the weakened aponeurosis of the *linea alba.*

§ 15. The principal means of cure of these herniæ, as of all others in general, consist in replacing the protruded parts as quickly as possible, and in keeping them constantly replaced by means of suitable compression. This is easily effected, and almost always with success, in cases of recent *adventitious* umbilical hernia in tender infants, in whom, in general, the protruded viscus is the intestine, free from all adhesion internally * with the peritoneum, and externally † with the hernial sac, and in whom the umbilical ring preserves still a certain degree of aptitude and tendency to contract, facilitated by the pressure employed, and by their being in the supine posture for the greater part of the day. The umbilical hernia in these children, is kept perfectly well replaced by means of a belt of linen or fustain, the pad of which should have the convexity of a button or half a nutmeg, and should be sufficiently elevated on the abdomen by the addition of one or more compresses, so that the point of compression may rest exactly upon the umbilicus, and on the spine, so that it may keep the viscera replaced, and press as little as possible on the sides of the abdomen.

* On the central aspect. † Peripherad.

Experience has already pronounced in favour of Richter, who recommends, in this hernia of children, the pad in the form of a button or top of a mushroom, or of half a nutmeg, as preferable to the flat compressor, however plausible the reasons of those may appear who are of a contrary opinion; because, by pushing the protruded viscera deeply, and therefore completely into the abdomen, it places the skin in firm contact with the aponeurotic margin of the opening, and does not prevent at all the contraction of the umbilical ring, into which the point of the button does not insinuate itself, properly speaking, as some would wish to make it be believed.

After the parts are returned, therefore, a piece of fine linen is to be applied over the depression of the umbilicus, and over it a button, which is to be kept *in situ*, by means of some strips of plaster, crossed in the figure of the letter X. From the centre of the button or pad, a thread passes out through the middle of one or more compresses fixed to the circular bandage. This belt of double linen or fustian, about five fingers broad at its middle part, and gradually diminishing to two at the sides, is passed round the abdomen, and is drawn moderately tight till it returns over the compress, to which it is fastened by two tapes on each side. And to prevent this belt from wrinkling at its middle part, corresponding to the umbilical region, it may be lined for a certain space

with fine glove leather, to keep it tense. In children more advanced in years, who are walking about, the *scapulary* should be added to this bandage, and if necessary, also the *thigh strap*, in order that the point of compression may neither be elevated nor depressed, but may be kept constantly upon the umbilicus. If it is wished to give a certain degree of elasticity to this apparatus, to adapt it to the different state of distention of the child's abdomen during the day, keeping always the same degree of pressure on the hernia, it is sufficient to substitute, instead of the fustian bandage, that formed with the addition of two elastic springs, called by the French *bretelles*, corresponding to one third part of the whole length of the belt.

§ 16. The constant attention which this bandage requires, that the pressure may not exceed certain limits, and may not be less than necessary, and the requisite cleanness of the apparatus, which can with difficulty be obtained by the nurses of the poorer class, has been, in my opinion, the laudable motive which induced Dessault to recall into use the operation of the ligature of umbilical hernia in children, nearly the same as is described by Celsus (*q*), but which had for a long time, and not without good reasons, gone into disuse. Celsus, entering into the detail of this opera-

(*q*) Lib. VII. cap. 14.

tion, says, that it is sometimes proper simply to tie the tumor, sometimes it is necessary to pass a needle and ligature through its base, and to tighten it as is practised in *Staphyloma*; then he introduces so many exceptions to the operation, drawn from the age, from the habit of body, from diseases of the skin and the like, that it seems as if he considered the opportunity of putting it in practice with success as very rare. The same reflexion has been already made by several antient writers of surgery, especially by Fabricius ab Aquapendente. Dessault even has not failed to introduce some restrictions with regard to the propriety of this operation, for he wrote with his usual ingenuity, that the ligature of the umbilical hernia is not a radical method of cure in children arrived at four years of age; that it is absolutely indispensible, as Celsus taught, to pass a needle and ligature through those umbilical herniæ which have a broad base; that even in young children, the ligature is not a mode in which entire confidence of a radical cure can be placed, without the successive application of the bandage compressing the umbilicus for two or three months after the operation. It is, I think, perhaps from this compression having been omitted, that several children operated on by Dessault have had a return of the disease (*r*). I have attended carefully

(*r*) Richerand, Nosograph. chirurg. tom. II. p. 453.—Dessault avoit remis en vigueur la ligature tombée en désuétude.

to the phenomena and success of this operation, performed sometimes by means of the simple ligature, sometimes by means of the passing it through the tumor; and after a very considerable number of practical observations, I feel myself authorised to say, that neither the one nor other mode of operating is exempt from violent, and sometimes even dangerous symptoms, and that neither of the operations produce a truly radical cure, without the assistance of compression continued for several months after the wound is cicatrised. I have observed that violent fever, not so unfrequently as some surgeons pretend, comes on after the ligature, from excess of irritation, of inflammation, of acute and continued pain, accompanied with almost constant crying and convulsive fits. After the tumor falls off, the ulcer which remains is always very large, always slow and difficult to heal, and becomes fungous and painful at intervals, without any evident cause, although it be dressed with dry lint.

A celebrated snrgeon (*s*) has recently, not without good reason, expressed a doubt, that in this operation, the umbilical vein and the falciform li-

Il s'abusoit sur sa valeur; et il n'est pas difficile d'en reconnoitre la cause. Tous les enfans qu'il opéroit à l'Hôtel-Dieu sortoient guéris, et n'y revenoit plus; on regardoit alors comme radicale une guérison momentanée.

(*s*) Paletta, Mem. dell' Istituto, tom. II. part. 1.

gament of the liver being included in the ligature, the inflammation may be easily extended along this course to the liver, so as greatly to endanger the life of the child. When symptoms of this sort occurred in consequence of the ligature of umbilical hernia, they were ascribed to an individual exquisite sensibility, and to a predisposition to spasm, and therefore, it was conceived, that they ought to be considered as so many exceptions, which do not affect the general rule and utility of this operation. But by what means can the surgeon, before undertaking this operation, know with certainty the force and extent of this predisposition in children? Those undoubtedly, under my care, which were attacked by the above mentioned accidents, were in every respect stout and healthy before the operation. In whatever manner the ligature may be applied to umbilical hernia, there can be no doubt, that the tumor can only be tightened without the aponeurotic aperture, around and before which, at a certain distance from the ring, the integuments remain relaxed and prominent; on which account, on the separation of the tied portion of the tumor, there always remains, after the cicatrix forms, a portion of hernial sac, and of flaccid integuments, which cannot be sufficiently constricted and strengthened by the puckering of the cicatrix, as it is always thin and yielding, and sooner or later, not being adequate to counterbalance the impulse of

the viscera, it occasions the hernia to re-appear of a larger size than before. And if it is the case of a girl, there is the farther danger, that, when she becomes adult, this relapse takes place during pregnancy; as it is demonstrated, that under these circumstances the cicatrix of the umbilicus is easily lacerated. Pott (*t*) was witness to dreadful accidents produced by the rupture of a cicatrix of the umbilicus during pregnancy, although this cicatrix, according to his account, was not the consequence of a hernia, but of an abscess of the umbilicus, opened by the knife; on which point there might be some doubt.

Farther, as there can be no doubt, that after the ligature there remains a small *funnel* or cavity, formed by the neck of the hernial sac, between the aponeurotic margin of the umbilicus and the integuments, this is a sufficient cause, why, after the operation, some portion of the abdominal viscera insinuate themselves into it, and prevent the aponeurotic aperture of the umbilicus from contracting and closing completely. We have a convincing proof of this, in the old manner of curing inguinal hernia not strangulated, by means of the ligature, including the spermatic cord, with the hernial sac. With regard to which cases we know, that the greater part of these herniæ returned, on account, without doubt,

(*t*) Chirurgical works, tom. II. p. 169

of the cicatrix produced by the ligature not being sufficient to push up completely into the abdomen the whole of the neck of the hernial sac, and the protruded viscera along with it. Even after the operation for incarcerated inguinal hernia, in consequence of which the cicatrix is as near to the aponeurotic ring of the groin as possible, there is no prudent surgeon, who, taught by experience, does not direct the patient to wear a truss during the rest of his life. On the contrary, it is a fact beyond all controversy, because it is confirmed by the practice of many ages, that compression of itself alone is a most effectual means of accomplishing the radical cure of umbilical hernia in young children, free from all danger, and which very rarely requires to be employed for a longer time than two or three months, provided proper attention be used. As the ligature, for the reasons stated, even when it is not followed by severe and dangerous symptoms, does not with certainty produce the complete cure of this disease without the aid of compression, therefore, with regard to the poor class, it is not of any important advantage, and with regard to the more wealthy it does not shorten the cure, because it never requires less than a month in the most fortunate cases, to bring the ulcer to complete cicatrisation. It is necessary to employ constant compression for other two months, to insure the favourable event of the attempt;

which coincides with the time which is usually requisite for obtaining a complete cure of umbilical hernia in young children, by the simple and harmless means of the circular bandage and compression.

§ 17. In adults, experience has shown, that the preference ought to be given to the elastic bandage for keeping the umbilical hernia reduced, or, as more frequently happens, that of the *linea alba* in the vicinity of the aponeurotic margin of the umbilicus. There are a variety of these machines more or less complicated, expensive and easily put out of order, but almost all of them do not correspond fully to the intention; because, in compressing the umbilicus, they press almost with equal force the sides and circumference of the abdomen. The least expensive, and at the same time that which has appeared to me to have fewer defects than any of the others, is the following.

Take a metallic plate, a little more than three inches long, about two lines in breadth, slightly curved, that it may suit the convexity of the abdomen. In the centre of this plate, is fixed the pad, of a size proportioned to the bulk of the hernia, having internally a spiral screw of metallic wire, not too rigid, nor too easily yielding. This plate applied over the hernia already reduced, is to be kept in its place by a circular bandage composed of two elastic belts, called by the French

bretelles, disposed in a line parallel to each other, and inclosed in a common sheath of soft leather or linen, that they may not be separated from each other, without however being made to adhere to the sheath. This elastic belt about three inches broad, surrounds the whole abdomen, and is attached to both sides of the plate, over which it extends more or less, as may be necessary. I have observed, that this elastic machine remains in its position without any additional parts, whether the abdomen be tense or depressed; and besides, that it is preferable to any other of this kind from its lightness, simplicity of construction, facility of application, and durability. However, if in any particular case, there is observed a tendency to shift upwards * or downwards, it will be easily prevented by means of the *scapulary* and *thigh-strap*, although hitherto I have not had occasion to have recourse to any of these subsidiary methods. I am treating here of the small umbilical hernia, and of that of the *linea alba*, in the vicinity of the aponeurotic margin of the umbilicus, for retaining which only a small degree of pressure is required. When this species of hernia is of considerable size, the spring truss is greatly preferable to the bandage above described, such as is employed for retaining inguinal hernia, with those modifications suggested by the structure of

* Atlantad or sacrad.

the parts over which it is to be applied. These modifications consist in enlarging the extremity of the semicircular spring, that it may make the point of support on the back (*u*), and in inclining the spring so that it may be adapted to, and rest flat on the spine, and on the top of the *ossa ilii;* and farther, we must give to the other anterior extremity of the spring the direction pointed out by the position of the hernia, taking care to proportion the force of the lever to the degree of pressure which is required for retaining the viscera steadily reduced. In persons, in whom the circumference of the abdomen is not enormous, I do not employ any other kind of bandage than this, and with the best success, whenever the umbilical hernia or that of the *linea alba* is of considerable bulk, and nevertheless easily reduced. It is proper to observe, that all the writers who have carefully pointed out the mode of retaining umbilical herniæ of a large size, but susceptible of complete reduction, have made mention of the spring truss for adults, similar to that which is employed for retaining inguinal hernia; yet there are very few surgeons who suggest to their patients this instrument, in those cases in which the compressor above described is not sufficient for the purpose. I can affirm that it succeeds perfectly well.

(*u*) Memoir first, § 22.

Surgeons are not agreed with regard to the form of the pad to be employed in adults, as well as in infants. Some recommend a convex one, others a pointed, and others a flat pad. With regard to the latter, I have not met with a single case of hernia truly umbilical, in which it would have been proper. In every hernia of this species, I have always found it necessary to make a deep compression by means of a pad slightly conical, in order to succeed in forcing the viscera completely into the abdomen, and to place the integuments in contact with the aponeurotic aperture of the umbilicus or the fissure of the *linea alba*. In the hernia of the *linea alba* which passes out* on one or other side of the umbilical ring, the cicatrix of the integuments of the umbilicus remaining untouched, as well as the contiguous skin, constantly form a projection, in consequence of which, a flat or slightly convex compressor could never sink as deeply as is requisite for reducing accurately the protruded parts. The flat compressor, at the most, might be proper for retaining the hernia of the *linea alba* situated a little† above or below the umbilicus, or on the cure of the one or other species of hernia being completed, with a view to flatten the integuments and cellular substance which have become adherent to the aponeurosis of the umbilical ring, or of the fissure of the *linea*

* Peripherad. † Atlantad or sacrad of,

alba, in order the farther to remove the danger of return.

§ 18. Great difficulty is met with in adapting the spring bandage to those herniæ of the *linea alba*, which, from their vicinity to the ensiform cartilage, are called herniæ of the stomach. However flexible the spring may be, the patients cannot bear it, and it produces great difficulty of breathing. To procure a convenient remedy for these herniæ, which are always small, and easily reduced by the slightest pressure, I have observed, that a corset of whalebone, constructed in the following manner, may be substituted with advantage for the spring bandage:—A pair of stays of strong linen surrounds the chest and abdomen, but is not furnished with whalebone, except at the back and sides. A band of linen four fingers in breadth, goes off from each side of the corset, one of which is slit in the middle for a small space. The button and compress secured with adhesive plasters, are applied over the small hernia, as is practised in the umbilical hernia of young children; then take the two tapes which go off from the sides of the stays, and pass the one within the other, as if it were an uniting bandage, and draw them in an opposite direction until the proper degree of pressure is applied to the button or pad. The ends of the two tapes, in the last place, are to be fastened to the sides of the stays, and

with a few stitches the centre of the bandage is to be united to the subjacent compress, directly opposite to the situation of the hernia.

§ 19. In general, it is an error to suppose, that small omental herniæ are more easily reduced and kept reduced, than large omental herniæ. This is more particularly capable of demonstration with regard to the small omental herniæ of the *linea alba* and of the umbilicus, than with respect to the others. For the narrow opening through which the omentum has passed, and the straitness of the neck of the hernial sac in small omental herniæ, are always less than the size which the protruded portion of omentum acquires; which circumstance opposes a considerable obstacle to the return, while in large hernia of this species, if we except the adhesion which the omentum too frequently contracts with the hernial sac, the size of the umbilical ring, greater proportionally in the large than in the small herniæ, very much facilitates the replacement. Art supplies a mode of overcoming these difficulties depending on the tightness of the umbilical ring in the first, and on the adhesion of the sac in the second, or at least of preventing the increase of both; this consists in the construction of an elastic bandage with a hollow pad, formed so that it exercises constantly a slight pressure on the tumor, such as not to incommode the patient at all in moving

about, and not to injure the viscera. This moderate pressure may be obtained, if the cavity of the pad is a little larger than the size of the hernia, and is covered internally by a soft cushion, the thickness of which should be gradually increased in proportion as the tumor diminishes in bulk, on the omentum returning into the abdomen. This point of practice will be very fully illustrated by thefollowing case.

" An omental hernia appeared in a noble la-
" dy(*u*) during the efforts of a very laborious la-
" bour, about a finger's breadth above* the umbili-
" cus. In about eighteen months the tumor had
" acquired the size of a tennis ball, about an inch
" in diameter, of which, besides the form, it had
" likewise the hardness. The root of this hernia
" was so slender and so similar to a pedicle, that
" several professional persons, excepting Marechal
" and Petit, conceived it to be an incysted tumor.
" I was consulted, six weeks after various remedies
" had been employed, and I discovered that this tu-
" mor was an omental hernia. My advice was to
" support the hernia, so that it should not increase
" in size. For this purpose, I took a plate of an
" oval form, six inches in its smallest diameter, and
" in its largest diameter ten inches. I gave as
" much concavity to the centre of this plate as
" was sufficient to receive and contain convenient-

(*x*) Arnaud mém. de chirurg. tom. II. pag. 518.

* Atlantad of.

" ly the hernia, and I adapted the rest to the con-
" vexity of the abdomen. In doing this, I took
" care that the inferior margin of the plate was
" a little more concave than the superior, so that
" it might follow exactly the inclined plane in the
" epigastric region, and that all the points of the
" plate, except the centre, might concur in form-
" ing a fixed point to the instrument, the con-
" cave part of which was properly quilted, and
" kept in its situation by a circular bandage.
" Three days after the application of this band-
" age, I found the tumor, beyond my expectation,
" diminished one half. I then filled the concave
" part of the plate with soft lint, and the follow-
" ing days I continued to do the same in propor-
" tion as the tumor diminished in size. On the
" seventh day I found the hernia completely re-
" turned. I immediately substituted the convex
" for the concave bandage, and desired the patient
" to wear it constantly. She became again preg-
" nant, and was not again subject to any return
" of the disease."

§ 20. I wish to observe, that Arnaud's concave bandage produces in fact similar good effects, whenever it is applied with due caution to this species of hernia of moderate size; but that it is not applicable with equal success to herniæ of this species which are very large and of long standing. These large herniæ, with a broad fundus and slen-

der neck, are inclined* from above downwards, and require, for being properly supported, that the suspensory bandage have a point of support, much more elevated than the neck of the tumor. On which account, I have observed, that in cases of large umbilical hernia, or of hernia of the *linea alba* inclined and hanging downwards†, the suspensory of Hildanus(*y*) with some modifications, is much preferable to Arnaud's concave bandage, and to any other bandage hitherto invented. This suspensory of Hildanus, consists of a corset of strong linen four ply, which goes down only as far as the union of the cartilage of the first false rib with the sternum. To the posterior part of this corset, opposite to the scapulæ, is sewed on both sides a band two inches broad, which comes down under the axillæ, inclining from‡ behind forwards over the abdomen, and is fixed by means of a clasp in both sides of a bag of double linen well quilted, in which the fundus and body of the hernia are accurately inclosed. The suspensory, the fixed point of which is on the scapulæ, can be raised or lowered according as may be required, by means of the two buckles. The bag may also be made of leather; for which purpose cut several pieces of leather in the shape of slices

* Sacrad. † Sacrad. ‡ The dorsal to the sternal aspect.

(*y*) Centur. III. observ. 64. See also the *outline*, figure 3. of Plate XIII.

of melon, which, when sewed together lengthwise, form a coat of such a depth as the size of the hernia. The point of support of this suspensory being, as has been mentioned, between the scapulæ, and not in the lumbar region, as when Arnaud's bandage is employed, is very convenient for supporting the tumor without incommoding the patient, and farther, the force which raises it up acts in the most favourable direction for the return of the viscera, if they are disposed to return entirely, or at least in part.

§ 21. The umbilical hernia, and the hernia of the *linea alba*, are more rarely subjected to strangulation than the inguinal or femoral hernia, but if they do become incarcerated, they are accompanied by most violent symptoms, and are more quickly than the others attacked by gangrene. And it is principally on this account, that the operation for umbilical hernia, or the hernia of the *linea alba*, is in most cases unsuccessful, because it is performed almost always too late. This fact in practice, is sanctioned by the experience of the most celebrated practical surgeons. It is certain, Dionis (*z*) remarked, that a greater number of persons who undergo this operation die, than recover from it. On which account, he added, all those who have the misfortune to have

(*z*) Cours d'opérations, pag. 118.

an umbilical hernia, ought rather to want a shirt than a bandage. Heister (*a*) made the same observation. Farther, although in umbilical hernia, or in hernia of the *linea alba*, the omentum only is strangulated, yet observation teaches us, that the symptoms are nearly the same, with this difference, that when there is only omentum, the symptoms are confined to nausea; and, if it is followed by vomiting, it is less violent and frequent than when it is produced by strangulated intestine. Besides, when the omentum alone is incarcerated, in most cases the discharge by stool is more or less free. The vicinity of the strangulation to the stomach is probably the cause, why the consentient symptoms occasioned by the strangulated omentum, are more violent in these herniæ than in the inguinal and femoral. The operation, which is always necessary, and which it is proper to perform without delay in these very urgent symptoms, does not differ in general from that which is practised for the incarcerated inguinal or femoral hernia; only, in the first case, greater attention is required than in the second, on account of the vicinity, I had almost said intimate connection of the integuments with the hernial sac, of the adhesion of the omentum to the sac in most cases, and of the manner in which the intes-

(*a*) Instituz. chirurg. tom. II. pag. 94.

tine is found covered or surrounded by the omentum.

In the case of strangulation of umbilical hernia of considerable size, in which the mass of protruded viscera is so great as to have lost the right of domicile, to use the expression, within the cavity of the abdomen, the most proper expedient to be adopted, provided there be not evident symptoms of gangrene already going on, is the same as is practised in large irreducible inguinal herniæ, that is, to divide the margin of the umbilical ring without opening the hernial sac. In performing this operation, a semicircular incision of the integuments is to be made on * the outer side of the root of the umbilical hernia, then carefully dividing the aponeurotic fascia covering it, the point of a probe is passed at pleasure between the neck of the hernial sac and the hard aponeurotic edge of the umbilicus, which is to be divided more or less as the case may require. If it is not possible in any way, but by extreme violence, to insinuate the point of a probe between the neck of the sac and the aponeurotic aperture, the surgeon will pass the point of the nail of the fore-finger of his left hand between the limits of the neck of the sac and the aponeurosis, and, with his hand unsupported, will divide the aponeurosis

* On the lateral aspect.

without touching the neck of the hernial sac. After this there will be reason to hope, that it may be possible to return into the abdomen, at least that portion of intestine or omentum which has recently protruded and enlarged the tumor, and increased the symptoms of strangulation; or if none of the viscera protruded for a long time without the abdomen, and adhering to each other, or to the sac, can be reduced, the division of the aponeurotic ring of the umbilicus will facilitate the descent and progress of the feculent matter in the tumor, which is as much as to say, will remove the strangulation. Finally, if even this expedient shall not be found effectual, it will remain in the power of the surgeon to open the neck of the hernial sac at the same place at which he has divided the umbilical ring, and in the same direction, which operation will always be less dangerous than that of laying bare the whole large mass of intestines and omentum, which cannot be returned into the abdomen, or if returned, cannot be retained there.

§ 22. A longitudinal incision is always sufficient for laying bare the body and neck of the sac of the umbilical hernia, or of the hernia of the *linea alba*, without there being any occasion for a crucial incision, or in the form of the letter T. The longitudinal incision ought always to be made with the hand unsupported and cautiously, be-

cause, as has been mentioned, the hernial sac is always very thin and very near to the skin, and often adherent to it. In the greater number of cases, the omentum presents first in this species of hernia in the adult, unless the intestine during a violent effort has perforated the omentum; in which case it is the intestine which appears, the moment the hernial sac is opened. The adhesion of the omentum to the hernial sac opposes the greatest difficulty to the introduction of the probe into the cavity of the abdomen, and this difficulty is greater on account of the density and hardness of the omentum at the points of its adhesion to the sac, which are in general very extensive. We may succeed however, by proceeding cautiously and examining the passage at various places, until a probe pushed sufficiently forwards is moved freely in the cavity of the abdomen. And this precaution is the more necessary, when, from the violence of the symptoms of strangulation, there is every reason to suppose that a small loop of intestine is enveloped or concealed between the folds, or within a capsule behind a fold of omentum, in which circumstances the surgeon is authorised likewise to divide the omentum, until the loop of intestine appears denuded in its whole extent. Having done so, if it be possible to introduce the point of Leblanc's *dilator* between the neck of the hernial sac and the protruded viscera, there can be no doubt, that by means of it, the

strangulation will be quickly removed, and the protruded loop of intestine may be returned; but if the straitness of the neck of the hernial sac is such, as only to admit into the abdomen a very fine grooved probe, the safest and most effectual method will be the division of the neck of the hernial sac along the probe, together with the aponeurotic margin of the ring, directing the incision downwards, if it be a case of *true* umbilical hernia, and to the one or other side of the aponeurotic aperture, if it be a hernia of the *linea alba*, which is the subject of operation (*b*).

§ 23. In this species of hernia composed of intestine and omentum, the intestine is for the most part free from strong adhesion: the omentum on the contrary, is almost always firmly adherent to the hernial sac, and for a considerable extent. On which account, in strangulated umbilical hernia, and in those of the *linea alba*, the omentum is almost never reducible, at least completely, into the abdomen. To obtain the reduction, it would be necessary to make a very large incision to separate it from the hernial sac, which would not

(*b*) Lambert having divided the aponeurotic ring, not being able to replace the loop of intestine, from its being greatly distended with air, covered the whole with compresses dipped in cold water. A few minutes afterwards, barborigmi began in the whole abdomen, and the intestine returned spontaneously. *See Recueil période. de la Soc. de Méd. tom. VI. p.* 88.

fail to produce fatal consequences after the omentum was replaced in the abdomen. Therefore, after removing the strangulation, and reducing the intestine, if there be any, it will be better to leave the protruded and adherent portion of omentum at the place where it is found, and to cover it with the sides of the hernial sac, and with compresses dipped in a decoction of mallows, and to continue this dressing until suppuration appears in the portion of omentum which remains protruded; at this time, the pedicle by which the protruded mass of omentum hangs may be tied without danger, and afterwards cut away, if it is long of falling off, leaving that part of the protruded omentum adhering firmly to the hernial sac, and preventing the cicatrisation, to exfoliate, and to be destroyed by means of gentle caustics.

§ 24. The mortification of the intestine in umbilical hernia, or in hernia of the *linea alba*, requires the same treatment as is employed in similar unfavourable circumstances in cases of inguinal or femoral hernia. This accident is *cæteris paribus* more severe in umbilical hernia, and in hernia of the *linea alba*, than in the inguinal and femoral; because in the former, it is almost constantly followed by an incurable fecal fistula, for the reasons explained in the preceding memoir, with regard to the means employed by nature for re-establishing the continuity of the intestinal

canal divided by gangrene. For, in the umbilical hernia, and in the hernia of the *linea alba*, the hernial sac is so firmly united to the skin, that the retractive powers of the cellular substance and of the peritoneum, are not sufficient, after the separation of the gangrene, to draw it as much into the cavity of the abdomen as is requisite for forming with it the *membranous funnel* of communication between the superior and inferior orifice * of the intestine divided by the gangrene. From thence it necessarily follows, that the superior aperture † of the intestine always remains on a level with the skin, and that the feces passing downwards through it, have no other outlet but by the wound, and if the wound be allowed to contract too much from negligence of the surgeon or of the patient, it occasions a renewal of the colics, and the re-appearance of symptoms similar to those of strangulation. On which account, in umbilical hernia, or in hernia of the *linea alba*, whenever the gangrene has destroyed a whole loop of intestine, as far as the vicinity of the ring of the aponeurotic fissure, it should be a general rule to keep the fecal fistula properly dilated, by means of a suitable tent of bougie or elastic gum, supported by

* The orifice leading to the stomach, and the orifice leading to the rectum.

† Leading to the stomach.

a well adapted bandage or belt, to be worn during all the rest of the life of the patient.

§ 25. This is not the case when the gangrene has destroyed only a small part of the whole circumference of the alimentary canal, so that the injury of the intestine is not unlike a fissure in it. In this case of mortified umbilical hernia, or hernia of the *linea alba*, the complete cure of the fecal fistula may be effected. For the corroded or ruptured side of the intestine having become adherent to the peritoneum opposite to the external* wound, allows the feculent matter to pass out by it for a certain time, while a portion of this matter runs along the canal still open on the sound side of the intestine, and proceeds by the natural way. Afterwards the wound daily contracting, the alimentary matter dilates the intestine more and more, opposite to the place of the rupture, and the discharge by stool becomes more abundant; at last the ulcer completely heals. Maria Guelfi, a Pavian, now twenty-five years of age, from her infancy had had a prominent navel, was subject to indigestion, and was very costive in her bowels. In the tenth year of her age, the umbilical hernia began to trouble her very much, occasioning from time to time violent pains of her

* Peripheral.

belly, nausea, and sometimes even vomiting, which affections were abated by the application of fomentations and glysters. In spite of the evidence of the causes producing these disorders, the umbilical hernia in this girl was not at all attended to. In process of time, the small tumor inflamed and burst spontaneously, discharging a great quantity of liquid feculent matter along with a lumbricus. A purgative was prescribed for the girl, which was repeated the following days. The external * opening of the fecal ulcer, having become too narrow for allowing a free outlet to the intestinal contents, was dilated by the knife. A second, and afterwards a third lumbricus was discharged by it; then the feculent matter began to take its natural course, and in two months the wound was reduced to a small hole, from which were discharged at intervals a few drops of yellow fluid matter. From this period the girl recovered her appetite and strength. Nevertheless, the costiveness returned, in consequence of which, if she neglected the use of glysters in due time, she was attacked by violent pains around the umbilicus and in the epigastric region. At present, or towards the end of the year 1809, Guelfi is married, and enjoys most perfect health; she does not suffer any more from costiveness, and does not feel any painful sensations around

* Peripheral.

the umbilicus, which is completely closed and cicatrized.

§ 26. Amyand (*c*) relates two cases similar to this. A girl fourteen years of age, says he, was entrusted to my care, in whom a small tumor at the umbilicus had suppurated. From her early infancy she had been affected with a fullness of the umbilicus, which enlarged from time to time, occasioning nausea, pain of the abdomen, and vomiting, which ceased immediately on depressing the umbilicus. These symptoms having become more frequent than usual, an emetic was prescribed for the girl, after taking which the constipation increased, and the symptoms of nausea, of intestinal colics, and vomiting, recurred more frequently and more violently than before. The little tumor of the umbilicus inflamed, and showed signs of incipient suppuration. A consultation was held, and it was determined to make a small incision into the tumor, in order to discharge the small quantity of matter contained in it. This was done, but the tension of the tumor, the colics and vomiting continued unabated, or rather increased. Doctor Halling was called in, who was convinced of the necessity of extending the incision already begun. For a fortnight, all those internal and external remedies were em-

(*c*) Philosoph. Transactions, vol. 38, 39. page. 336.

ployed, which are considered as most effectual in promoting the natural course of the feces, but without advantage, as during all this time the girl had no stool, and in the mean time the above mentioned symptoms increased to a greater degree than before, especially the tension of the abdomen and the vomiting, to which symptoms were added a suppression of urine. The girl, oppressed by all these complaints which mark the approach of gangrene of the intestines, was at the last extremity, when the intestine suddenly burst, and a great quantity of feculent matter was discharged by the wound, carrying along with it abundance of lumps of fruit, with evident relief to the little patient. The feculent matter continued to pass by the wound during the whole day. Afterwards, as the aperture of the hernial sac and that of the external * ulcer, were not in a proper direction with the rupture of the intestine, the discharge of the feculent matter was a little retarded, and still more by the intervention of some ill digested substances. To remove this inconvenience, the aperture of the integuments and of the hernial sac was again enlarged by the knife, after which the girl was no longer incommoded by colics or vomiting; and it was then that some hopes of success began to be entertained, although the feculent matter continued to flow abundantly

* Peripheral.

by the wound. The girl took nourishment and slept well. The uninterupted use of fomentations and glysters, caused the feculent matter to resume its natural course twelve days after the rupture of the intestine at the umbilicus: on the restoration of which the girl had nearly lost her life, in consequence of an immoderate diarrhœa that continued for two days. Fortunately this was stopped by the use of absorbents and diluents, and after this accident the wound of the umbilicus healed, and the girl, in three weeks after, was in perfect health.

§ 27. The second case related by the same author, is not less interesting than the first. In a girl, about four years of age, affected with umbilical hernia, the same morbid causes mentioned in the preceding case produced the same melancholy effects. For, after the separation of a portion of strangulated omentum, the intestine burst in the umbilicus, by which the feces were discharged in abundance. The symptoms which preceded the rupture of the intestine, and the occurrences which followed it, were precisely the same as in the case just related. The cure however was more tedious than in the first, on account of the frequent intervention of stones of raisins between the rupture of the intestine and the external *

* Peripheral.

wound. The fecal fistula remained open for the space of twelve months; it then closed, the feculent matter having previously resumed its natural course. This girl afterwards grew up and was a mother, and did not experience any inconvenience at the umbilical region.

§ 28. In a girl nine years old, after a fall from a height, as the author relates, an umbilical hernia (*d*) appeared, which, in the course of a year, increased to the size of a pigeon's egg. During this time, the tumor occasioned many inconveniences to the little patient; at last it inflamed and mortified. The gangrene having perforated the intestine along with the integuments of the umbilicus, a worm passed out by the aperture, then much fluid fecal matter, with leaves of parsley mixed in it, which had been boiled with the meat for making the soup with which the patient was nourished. After the rupture of the intestine, and the copious evacuation of feces by the umbilicus, all the alarming symptoms ceased. The strength of the patient was supported by cordials and proper diet. The local applications were merely topical emollients and detergents, along with a moderate degree of pressure. The natural course of the excrements was restored, and

(*d*) Teichmayer. Dissert. de exomph. inflam. exulcerato et postea consolidato.

the umbilical tumor disappeared. Facts similar to these, though not equally well detailed, are met with in Hildanus, Rousset, Benivenius, and others.

§ 29. In circumstances similar to the preceding, an opportunity occurred to me of examining, in the dead body, the state of the parts which had constituted the umbilical hernia, and especially the place where the rupture of the intestine had taken place, and of observing in what manner the continuity of the intestinal canal was, if not entirely, at least in a great measure, maintained after this accident.

Maria Boveri, a Pavian, a girl ten years old, had been affected for several months with a fecal fistula at the umbilicus, in consequence of suppuration and rupture of the intestine protruded in an umbilical hernia; from this fistula was continually discharged yellow fluid feculent matter, although at intervals she also passed feces by the anus. Eleven months after the rupture of the intestine, the fistula at the umbilicus, as I was informed, contracted very much, and then another appeared three fingers breadth below it, through which the fluid fecal matter was again passed as before. A year after the formation of the second fistula, the girl became unusually emaciated, and fell into a state of marasmus. Lastly, she was affected with con-

stant fever and colliquative sweats, afterwards by most acute pain of the abdomen, with total suppression of stools, during the violence of which symptoms she expired. On opening the body, I found a clew, to use the expression, of small intestines adhering together, and partly adhering to the peritoneum opposite to the umbilicus. Having with difficulty separated this mass of intestines, I discovered the one which had been ruptured. The edges of the rupture adhered very firmly to the peritoneum in the umbilical region, properly so called, and the injured intestine formed an obtuse angle with the wound at the point of adhesion. The rupture was then reduced to about two lines and a half in length. From this opening a probe introduced from* within outwards, and from above downwards, entered a cavity between the aponeurosis of the linea alba and the integuments, and passed † out by the inferior ‡ fistula three fingers breadth below § the umbilicus. The coats of the intestine opposite the place of the rupture were much thickened, and its caliber was so much contracted at that place, that it with difficulty allowed the introduction of a probe of the size of a pigeon's quill. However, water injected passed with sufficient freedom; which was probably not the case with the excrementitious mat-

* The central towards the peripheral aspect, and in a direction from the atlantal towards the sacral.

† Peripherad. ‡ The more sacral. § Sacrad of.

ter, as the superior* portion of the intestine was evidently enlarged. The fecal fistula, which had formed three fingers breadth below† the umbilicus, had not been occasioned by a new rupture of the intestine, but was caused by the too great contraction of the superior‡ fistula. The fecal matter gradually infiltrated between the *linea alba* and the integuments, and procured a new outlet lower§ down below the umbilicus. On which account, it may with probability be supposed, that the unseasonable contraction of the first fistula had contributed greatly to accelerate the loss of this child; by occasioning a recurrence of the symptoms of strangulation, the adhesions between the mass of intestines were increased, and the infiltration of fecal matter took place between the *linea alba* and the integuments below‖ the umbilicus. It would undoubtedly have been prudent in the surgeon to have prevented this taking place by means of the dilatation of the first fistula, as in the cases already related, and by the introduction of a suitable tent, to be removed and replaced several times a day, even if it had been necessary to keep up a perpetual fecal fistula.

§ 30. I cannot affirm whether the fecal fistula is more frequent in the female than in the male.

* Atlantal. † Sacrad of. ‡ More Atlantal.
§ More sacrad, and sacrad of the umbilicus. ‖ Sacrad of.

From the observations of others on this subject, as well as from my own, it would appear, that it occurs much more frequently in the former, although no plausible argument can be adduced with regard to the causes which produce this disease in the one sex rather than in the other.

I very lately examined the body of a young lady who died of marasmus, occasioned by disease of the uterus, and from the bursting open, after very acute pains of the abdomen, of a fecal fistula a little below* the umbilicus, which had existed from her infancy, but had frequently opened and closed, and which had at last been considered as perfectly cured, from having been cicatrized for two years. In this lady, even after the re-appearance of the fecal fistula, the stools had never been totally suppressed, not even at the last period of her life. In the dead body, the parts contained in the abdomen presented a knot of small intestines adhering to the peritoneum opposite to the seat of the fistula, as in the preceding case. The sound side of the ileum next to the attachment of the mesentery, although thicker than usual, left a space between it and the internal† margin of the rupture of the intestine, along which a part of the feculent matter continued its natural course. The intestine‡ internally around the place of the rupture, was deprived of its na-

* Sacrad of. † Central. ‡ On its central aspect.

tural villous appearance, but in a less degree towards the point of attachment of the mesentery. There was not the smallest appearance in this, as well as in the preceding case, of membranous *funnel* formed by the retraction of the neck of the hernial sac. On which account, comparing the pathological state of the parts contained in the abdomen after a ruptured umbilical hernia, with the same parts in consequence of mortified inguinal or femoral hernia, I have not the least hesitation in asserting, that although in a case of ruptured intestine in umbilical hernia, or in hernia of the *linea alba*, there is reason to hope for the cicatrisation of the fecal fistula, a relapse is much more to be dreaded in these circumstances than in inguinal or femoral hernia destroyed by gangrene, precisely on account of the want in the first case of the membranous *funnel*, formed by the retraction of the neck of the hernial sac, and of the presence of this membranous *funnel* in the second case, or in inguinal and femoral hernia.

§ 31. In asserting, as I have done above, that in gangrened hernia of the umbilicus or of the *linea alba*, there is no reason to hope for the re-establishment of the natural course of the feces, except when the intestine is merely ruptured, and never when the whole loop of protruded bowel has been destroyed by gangrene, I was fully aware, that a fact might be cited, which has all the ap-

pearance of forming an exception to the general proposition which I have laid down. But if I am not very much mistaken, this fact attentively analized, far from diminishing, even adds to the weight of my assertion. The fact to which I allude is the following (*e*).

Madame Marsilière, fifty-six years of age, had been for a long time affected with an umbilical hernia consequent to a labour. The viscera passed out * and returned with equal facility, for which reason the patient never used a bandage. On the 30th January 1770, she attempted to replace the viscera in the abdomen in the usual way, but did not succeed. She was attacked with pains around the umbilicus, the tumor was hard, and she became feverish; this began to alarm the patient, not however to such a degree as to make her apply for the assistance of a surgeon in time. It was not till the fifth day, the author writes, that I was called in. I found the patient distressed with all the symptoms of strangulation. The tumor was of a very considerable size, and its livid colour indicated the state approaching to gangrene of the viscera contained in it. I proposed the operation, which was not agreed to.

(*e*) Chamery-Havé, Journal de méd. de Paris, tom. 36. pag. 539.

* Peripherad.

I applied poultices, fomentations, and glysters, and towards eleven o'clock at night, I made an attempt to reduce the viscera, but in vain. I discovered that the gangrene was making progress, and this was so rapid, that the following day the whole tumor was black. The symptoms then became very alarming; meteorismus, hiccup, almost constant vomiting of feculent matter, acute pain of the abdomen without intermission. The patient, reduced to this state, resolved to submit to the operation. I found, on opening the sac, that the intestine separated piece-meal. The feculent matter was discharged abundantly by the wound, and continued to pass all day. What kept me in the greatest perplexity, was, that the gangrene seemed to attack even the viscera contained in the abdomen. Following the example of Lapeyronnie and Lafaye, I began by cutting away the whole gangrened portion of the omentum, along with the hernial sac and sphacellous integuments; afterwards having dilated the umbilical ring, I endeavoured to draw out as much as possible of the intestine, that I might ascertain the extent of the gangrene. I cut away at least seven inches of mortified intestinal canal. Uncertain with regard to the state of the superior and inferior* portion of the divided intestine, as the gangrene

* Atlantal and sacral.

extended farther, and besides, fearing to lose too long a portion of the intestinal canal, I preferred attempting to preserve and re-animate these parts, which I had some hopes of saving from total destruction. The portion of mesentery corresponding to the intestine that was cut away, being likewise gangrenous, was removed with a slight loss of blood, and by means of two stitches the lips of the wound of the mesentery were drawn together, and with them the two orifices of the divided intestine. Following the practice of Lapeyronnie, the two extremities of the intestine remained * externally. I washed the wound with tepid wine, and applied the proper dressings, and I directed glysters to be thrown up from time to time. The patient being very weak, took frequently a little wine and strong soup. On the following day, at six o'clock, A. M. I found the wound very black and the gangrene extending. I removed several long pieces of putrid cellular substance, and dressed the wound as on the preceding day. The abdomen remained tense, but the pulse kept up tolerably well. On the 6th of February, I found that the gangrene had made farther progress † externally. I made some scarifications all round the wound, and on the mesentery at a little distance from the points of the

* Peripherad. † Peripherad.

sutures, and removed several other portions of sphacellated cellular substance. Finally, perceiving that the gangrene continued to extend, I determined to make the patient take a decoction made of an ounce of bark in two pints of water, adding, after it was boiled, twenty grains of sal ammoniac, besides some cordials and a little hartshorn jelly. On the 8th, I had the pleasure of perceiving that the gangrene began to stop on the integuments, but the bottom of the wound was nevertheless quite black. On the 9th, the gangrene appeared quite circumscribed * externally. The bottom of the wound, as well as the portion of intestine retained at the outer † part, seemed disposed to recover its vitality. The tension of the abdomen was moderate, and the fever very trifling.

The cure went on in this manner till the 15th February, at which time I began to conceive great hopes of success. From this day to the 20th February, the bottom of the wound and the intestine continued always to acquire a better aspect, as well as the mesentery, from which the stitches were thrown off. I then intermitted the decoction of bark, and ordered the patient only to use a cooling decoction, and a few spoonfuls of hartshorn jelly. The abdomen had become quite soft,

* On the peripheral aspect. † Peripheral.

the fever was gone, the pulse full, sleep sound, the surface of the intestine left externally * was becoming granulous. Encouraged by this success, I ventured to hope for a radical cure of the patient, and relying upon the observation of Ramdhor, I brought one extremity of the intestine close to the other, then introduced the superior † into the inferior ‡, and kept them united by means of a few stitches. Thirty-six hours after this operation or *invagination*, the greater part of the feculent matter resumed its natural course, so that only a small portion of the most fluid matter passed by the wound. These favourable circumstances continued till the 25th February. On this day, I was very much surprised to find the wound covered with excrements, the sutures separated, and the apertures of the intestine disjoined, which however had not retracted beyond § the umbilical ring. I dressed the wound as usual, till the end of February; it was always covered with excrements, and sometimes lumbrici, as nothing passed by the natural way. Wearied with persevering in a treatment which removed me farther from the end which I had proposed to myself, I exhorted the patient to consent to allow me to try the *invagination* again; to which she submitted, although with repugnance. This was

* Peripherad. † Atlantal. ‡ Sacral. § Centrad of.

on the 13th March. The inferior * extremity of the intestine did not appear to me to be in a healthy state, I therefore cut away nearly an inch and a half of it, not wishing to expose myself anew to the risk of the stitches giving way, in consequence of the flaccidity of the coats of the intestine. I then introduced the superior † extremity of the intestine into the inferior ‡, and I endeavoured to keep them united by a single stitch, including in the loop of the ligature as much as possible of the substance of the intestine. The same day, eight hours after the operation, part of the feculent matter passed by the anus, and also on the following days. The patient was supported with animal jelly every four hours. Towards the end of March, I took care to keep the body easy by means of glysters. In spite of this, some portion of feculent matter, as also some more lumbrici, were discharged by the wound for a fortnight longer. The feces then took entirely their natural course, and none passed out by the wound, which on account of its great extent was not cicatrized till the end of April. Afterwards, this person of whom we are speaking did not experience any pain of the abdomen, and continued to enjoy good health.

* The extremity of the sacral portion.

† The extremity of the atlantal portion. ‡ Sacral.

§ 32. This fact will appear to many persons exaggerated; and certainly so many fortunate combinations in one person, do not appear credible, or at least will be regarded as very rare, and not sufficient to establish a rule to be followed in similar cases. Whatever may be the opinion with regard to the truth and correctness of this account, the mode above detailed of re-establishing the continuity of the intestinal tube, divided completely in consequence of mortified umbilical hernia, has nothing in common with that which nature by its own powers alone employs for preventing and curing the fecal fistula occasioned by gangrene of a whole loop of strangulated intestine in inguinal or femoral hernia. Therefore, the method of cure above related, in my opinion, only proves more completely, that nature of herself alone, in a case of umbilical hernia completely mortified, is not capable of effecting a similar cure, as she does very frequently after a complete separation of the intestine from gangrene in inguinal or femoral hernia; in which cases, daily experience shows us, that it is not at all necessary to have recourse to the *invagination* of the two orifices of the divided intestine. And if there is no other method hitherto known, but that of the *invagination* for obtaining similar success in a case of completely gangrened umbilical hernia, or hernia of the *linea alba*, I have already shown, in

the preceding Memoir, how very great difficulties are opposed to this attempt, which are not lessened by one solitary example of success. We cannot thence hope to meet with circumstances equally favourable to the event of the operation, as in the patient the subject of this observation, who was enabled to bear so much distress, as a cold-blooded animal could have scarcely endured, without being deprived of life in a short time.

Nevertheless, it deserves the serious reflection of those who shall be disposed to try the *invagination* again, that in the case just related, the intestine was not introduced into the other in a state of inflammation and of increased sensibility, but only after the exfoliation of its external surface had taken place, and after it was covered with granulations, without the introduction of any foreign body, and without the apertures of the intestine being kept in their situation by an extensive suture, but merely by means of a few stitches. It is not improbable, that the intestine in the state of granulation of its surface, may be capable of being handled and sewed with less danger of producing those alarming accidents, which have been observed to occur in man after the *invagination*, as well as in the animals on which this operation has been hitherto performed. Therefore, in a matter of so much doubt, and when we have not the opportunity above mentioned, in

which some confidence can be placed in the success of the *invagination*, a circumstance I consider as very rare, the least uncertain mode of preserving the life of the patient is undoubtedly that of maintaining the fecal fistula in the proper degree of dilatation, that the feculent matter may find a free exit at given intervals, without any risk of infiltration between the aponeurosis of the abdominal muscles and the integuments.

§ 33. I do not know, if among the accompanying accidents which aggravate the danger of hernia in general, there is any case on record of hemorrhage produced by the spontaneous rupture of one of the mesenteric veins in the portion of mesentery corresponding to the intestine protruded in hernia, in consequence of which the blood has made its way outwards in a continued and impetuous stream, the coverings of the hernia and the common integuments having been previously removed, and afterwards ruptured. I had an opportunity of observing a case of this kind in consequence of a small hernia of the *linea alba* situated a little below* the umbilicus, the fatal history of which accident seems to me worthy of being registered in the records of surgery.

Maria Biancardi, a countrywoman, twenty-five years of age, in the twelfth year of her age and

* Sacrad of.

five months after having the small pox, was attacked by very violent pains of the abdomen, during which an abscess formed a little below* the umbilicus, which burst spontaneously; afterwards being dilated by an incision, it discharged a great quantity of fluid yellow matter; it then healed completely. At the age of puberty she menstruated without uneasiness. After being married she had no children, and was subject to menorrhagia. When about one and twenty, a small tumor appeared without any evident cause, at the place of the former cicatrix a little below† the umbilicus, which gradually increased to the size of half a small nut. Afterwards she felt in the tumor a troublesome sensation of prickling, and then a noise sensible even to the touch, and not unlike that produced by an *aneurismal varix*. Towards the end of January 1809, being engaged in washing clothes, the tumor burst and discharged blood with great impetus, and in a continued stream. The neighbours coming to her assistance, endeavoured as much as possible to stop the violent hemorrhage, but they did not succeed till after three quarters of an hour, and when the woman had already fainted. The blood discharged had all the characters of venous blood.

* Sacrad. † Sacrad of.

In the course of seven days the patient gradually recovered; but on first getting out of bed the jet of blood re-appeared as before, and although a surgeon was called, he did not succeed in stopping the hemorrhage till after using constant and strong compression for an hour. The patient remained quite cold, and almost deprived of sense for two days. A week had not yet elapsed, when the woman remaining at perfect rest in bed, the blood burst forth copiously for the third time, and reduced the patient to a state of extreme exhaustion.

On the 17th February, the woman, almost lifeless, was brought to this hospital. The singularity of the case, but especially the extreme debility of the patient, who appeared almost *in articulo mortis*, kept me from laying open the tumor and proceeding at the moment to search for the open vessel or vessels, and I thought it better to temporize a little before doing this, until the patient had recovered a little strength by means of proper nourishment, and the application of a compressing apparatus more appropriate and methodical than had been hitherto employed. She told me that the jet of blood had always proceeded from a cutaneous vein, which ran transversely from the base of the small tumor towards the right groin; which vein enlarged unusually a little before the blood burst out of the tumor. This correspond-

ence indeed was not evident nor proportioned to the effect; however, as this vein was preternaturally enlarged, quite cutaneous and superficial, it was tied at two places, but without advantage; for in three days afterwards the hemorrhage returned, and although it was almost instantly stopt, it was enormous, considering the feeble state of the patient. I then observed that the aperture of the integuments, from which the blood flowed, was so large as to admit the point of the little finger, which circumstance was not apparent at first, on account of the depression and puckering of the integuments covering the tumor. I took advantage of this opening, and was by it easily enabled to fill the tumor with lint dipped in an astringent solution, over which I replaced the compressive apparatus. The hemorrhage was completely stopt, and did not return during the remainder of the life of the patient. In the mean time, I endeavoured, by every possible means to revive and recruit the patient; but in vain, her strength daily diminished; aversion to food came on, followed by nausea, and vomiting also at intervals. On the 3d March the dressings were renewed, and in the situation of the tumor a gangrenous escar was found about the size of half a crown, in which I had placed all my confidence of the contraction and obliteration of the orifice of the vessels which had discharged so great a quantity of blood. On

the 7th March the gangrenous escar was detached, and a considerable quantity of yellow fluid matter, evidently feculent, was discharged from the wound. The patient had always voided the excrements and flatus by stool, and still passed them in spite of the evident aperture of the intestine in the bottom of the tumor. Reduced to an extreme degree of debility, on the 9th she was attacked by convulsions and sopor, and expired during the following night.

After removing the common integuments of the abdomen, I discovered that the cutaneous vein, which had been tied, had no communication with the bottom of the wound situated a little below* the umbilicus. Behind† the recti muscles I followed carefully the course of the epigastric and *internal* mammary arteries and veins, without finding any mark of these vessels having had any share in producing the fatal hemorrhage. Having opened the abdomen, I was very much surprised to see the extensive adhesions which the omentum and the intestines had contracted with each other, and with the peritoneal sac, without there being any inflammation of these parts, which showed that these adhesions were of old date, and that without doubt, they might be referred to the period when the girl laboured under the acute pain

* Sacrad of. † Centrad of.

of the abdomen for several days, followed by the abscess a little below* the umbilicus. Opposite to the seat of the little tumor, was observed a mass of small intestines, adhering very firmly to the peritoneum for the space of half a hand's breadth; and more precisely opposite to the bottom of the wound, there was an opening in the ileum externally †, without the smallest mark of previous inflammation, or of destruction by gangrene, as the gangrenous escar was already completely separated. The point of the little finger could be introduced through this aperture in the intestine, and passed freely upwards and downwards ‡ within its cavity; which accounted for the patient having always passed the excrements by the natural way, from her twelfth year to the termination of her life. The umbilical vessels, converted into ligaments, had no connection with the wound. The liver, the spleen, and pancreas, were of a much greater size, and harder than natural, and, properly speaking, obstructed. After this examination, it remained still quite uncertain from what vessels so much blood had been discharged.

In the vicinity of the protruded intestine, adhering to the peritoneum, and opening externally §, on pressing between the fingers the mesen-

* Sacrad of. † Peripherad. ‡ Atlantad and sacrad.

§ Peripherad.

tery loaded with fat, a cylinder of considerable size was felt, deep seated in the fat, passing along the mesentery in the direction towards the bottom of the abdominal wound. Having separated this dense layer of fat, in which the cylinder was immersed, from the mesentery, it appeared to be a large mesenteric vein full of grumous blood, and on making an incision with a lancet into this vein, and introducing a probe into it, it passed out freely by the wound of the abdomen, between the intestine and the peritoneum, by an aperture not less than two lines in diameter, and showed clearly from whence so much blood had been discharged. This vein was twice the size of a large quill. All the other branches of the *vena portæ* were unusually dilated, including the *internal* hæmorrhoidal veins, none of them however so enormously, as that which had burst in the bottom of the small tumor situated below * the umbilicus.

From farther enquiries made at the parents, and the surgeon of Chignuolo, the native place of the deceased, there remains no doubt that the abdominal inflammation and suppuration in the infancy of this woman, had been preceded by an incipient hernia of the *linea alba*, and followed at that time by a rupture of the ileum, which after-

* Sacrad of.

wards closed in a few weeks. During the suppuration and effusion of the feculent matter by the wound, the sac of peritoneum had been destroyed, and a portion of the aponeurosis of the *linea alba* weakened and thinned; in consequence of which, after the cicatrisation of the abscess, there were for several years only the common integuments to oppose any resistance to the intestine, which might have protruded to form a large hernia of the *linea alba*, if it had not been retained in its place by the strong adhesion which it had contracted with the peritoneum, opposite to the bottom of the small tumor. This point of the abdomen, nevertheless, remained the weakest of its whole circumference. In progress of time, the great obstruction of the abdominal viscera, occasioned, as it usually does, a great dilatation of the mesenteric veins, among which the branch that was found without support, opposite to the bottom of the tumor covered by the integuments only, yielded more than any other vein of the same order to the pressure of the abdominal muscles and of the diaphragm, in consequence of which it became gradually enormously dilated, and at last burst within the tumor, in the same manner as happens in hæmorrhoids.

Lastly, by the continued pressure, the integuments being ruptured, the blood burst forth from the tumor in a large and continued stream, as it

is a well known fact, that the mesenteric veins have no valves. And it is proper to observe here, that the orifice of the mesenteric vein, situated between the intestine and the remains of the neck of the hernial sac, was very firmly adherent all around to both of these parts, so that, if even on the first appearance of the hemorrhage, the tumor had been laid open, so as to examine its bottom distinctly, it would have been impossible, either to draw out the ruptured mesenteric vein, or to tie it in any way; and therefore, that on the first appearance of the stream of blood, it would have been absolutely necessary to have had recourse to compression applied immediately to the open mouth of the vein, the only means which remained in the power of the surgeon to adopt. But since under the circumstances explained above, it appears, that from the vicinity of one of the sides of the ileum denuded under the integuments, and in the bottom of the tumor, and from the narrowness of the place, it would not have been possible to compress with precision the opening of the mesenteric vein, without pressing at the same time on the denuded side of the ileum, the rupture of this intestine by the separation of the gangrenous escar would have been inevitable, even although the tumor had been laid open, and its bottom filled with lint soon after the first hemorrhage. There is however reason to believe, that if this mode of

stopping the hemorrhage, the only one practicable in this case, had been employed before the patient was reduced to the state of extreme exhaustion, it would with much probability have saved her life, subjecting her to a perpetual fecal fistula.

APPENDIX.

By the term Hernia, is understood a protrusion of a soft part from any of the three principal cavities of the body in which it was contained in the natural state, into a preternatural cavity formed in the surrounding parts. But as abdominal herniæ occur more frequently than any other, the term hernia is in general confined to tumors formed by the displacement of the viscera contained in that cavity. There is hardly any disease requiring surgical assistance, which is more frequent, and apparently mild, more diversified in degree, species, and complication, and requiring greater judgment, caution, and experience on the part of the surgeon.

Hernia has been defined "a tumor caused by "the protrusion of one or more of the viscera "from the abdominal cavity into a sac; which "sac is formed by the peritoneum, the investing "membrane of that cavity, covered by the com-"mon integuments." Hernial tumors, in general,

occur where there is a natural opening for the transmission of vessels or other parts, from which they receive particular names. They most frequently appear at the inguinal rings, under the femoral arch, or pass out through the umbilical aperture, and more rarely at the foramen ovale and sciatic notch. When they protrude at any other point, they are called *ventral herniæ*. Ventral herniæ are most frequently met with in the circumference of the natural openings, in the *linea alba* above or below the umbilicus, in the *linea semilunaris*, the perinæum, vagina, or any part of the abdomen, where the parietes are not supported by bones, or after wounds of the abdomen. But in these cases there must always be a previous relaxation, or debility of the muscular parts, the fibres of which are either separated or ruptured, to admit the protrusion of the peritoneum and contained viscera.

In hernia, great diversity takes place with regard to the parts contained in the tumor, as none of the viscera of the abdomen are exempt from displacement. The omentum and small intestines are most frequently found in hernia; the cæcum, colon, and other viscera more rarely. These tumors therefore have received various names. If they are formed by intestine only, they are called *enterocele*; if by omentum, *epiplocele*; if by both omentum and intestine, *entero-epiplocele*; if by the stomach, *gastrocele*; if by the urinary bladder,

cystocele, &c. Herniæ have also received different appellations, according to the number of the viscera protruded: they are called *simple* when one viscus only is displaced, as in the epiplocele or enterocele, and *compound* when more than one have descended at the same time, or in succession, as in the entero-epiplocele. A hernia is said to be *perfect* or *complete*, when the whole or the greater part of a viscus is displaced, as when the whole urinary bladder passes out of the inguinal ring, and in a case of *enterocele* the hernia is called *complete*, when an entire loop of the intestinal tube is protruded. The hernia is called *imperfect* or *incomplete*, if only a part of any bowel has changed its natural place, as when the fundus of the bladder presents in any preternatural situation, and in *enterocele*, if only a segment of the parietes of the intestine passes out * (*a*). Herniæ vary much in size; sometimes they increase so much, that they contain almost the whole mass of the abdominal viscera, and at other times they are so small, that they can with difficulty be detected, amidst a cluster of glands or adipose parts, and their presence is only indicated by the symptoms which they produce. They sometimes appear suddenly and gradually increase; sometimes they acquire a very large size at the very moment of their origin.

(*a*) Bertrandi opere anatomiche e cerusiche, tomo II. p. 247.

* Peripherad.

Their appearance may often be foretold by a painful sense of pressure around the ring, or an impulse communicated to the hand on coughing.

Herniæ occur in three states, they are either *reducible*, *irreducible*, or *strangulated*. They are said to be *reducible*, when the parts admit of being reduced without difficulty, either on placing the patient in a proper posture, or on applying moderate pressure to the tumor; *irreducible*, when they cannot be reduced, either from the viscera having contracted adhesions with each other, or with the hernial sac, or from being long protruded, the cavity of the abdomen is so much diminished, as not to allow them again to be returned. They are said to be *strangulated* or *incarcerated*(*b*), when they cannot be reduced in consequence of the pressure exercised on the contents, by the parts through which they have passed, or by a sudden increase of the bulk of the protruded parts.

DIAGNOSIS.

The general diagnosis of hernia requires the greatest attention the surgeon can bestow. Every swelling which is observed at any of the places where herniæ usually appear, and which has arisen suddenly, or after an exertion, excites the suspi-

(*b*) Scarpa makes a distinction between *incarcerated* and *strangulated* hernia. See p. 295.

cion of its being a hernia. There can be no doubt about the nature of the disease, if the tumor is not always of the same size, and becomes smaller when the patient is in the horizontal posture; and if it becomes larger and tense when the patient stands erect or holds his breath; when it is diminished by the application of the hand, and regains its former size as soon as the pressure is removed; when it increases in size, and is tense after meals, or when the abdomen is distended with flatus, and is small and flaccid in the morning before the patient has eat any food; when the patient after the appearance of the swelling is occasionally affected with colics, nausea and vomiting, constipation and other symptoms of disorder of the viscera of the abdomen; if the patient sometimes observes a gurgling noise in the tumor, especially when it is returning into the abdomen, or is even affected with colic pains in it; and, lastly, if the swelling becomes tense when the patient coughs, and he is then sensible of motion in it, and subsequent enlargement. However, all of these symptoms are not present in every hernia, nor in every state of the disease. If the tumor is small, deep-seated, and has arisen slowly, if it is irreducible or complicated with other tumors, or contains much fluid, especially in fat persons, the diagnosis is more difficult, and the nature of the case can only be ascertained by attention to the existing symptoms or previous causes.

It is sometimes possible for the surgeon to distinguish what viscera are contained in the hernia. When it is formed by intestine, the tumor is smooth, elastic, and of a rounder form, and the patient is often sensible of a gurgling noise, or even of colic pains in it, and whenever the patient is distressed with flatus, the swelling becomes unusually tense, and on reducing it, the surgeon is also sensible of the gurgling noise. The omental hernia is more rarely met with in infants, and is more frequent in fat persons, the tumor increases more slowly, is of an oblong shape, and has a doughy unequal feel, and does not swell much when the patient holds his breath; it is more difficult of reduction, and retires slowly, and without any gurgling noise, and is often accompanied with symptoms of tension of the abdomen. It is proper to observe, that, in general, the diagnosis of omental hernia is more difficult, and it is more liable to be confounded with other tumors even by experienced surgeons.

If the patient is affected with ischuria or difficulty of making water, we may conclude that the urinary bladder is protruded. Some years ago, I met with a case of femoral hernia of this kind in a woman forty years of age. The tumor was about the size of a walnut, deep-seated in the bend of the thigh, and covered by a lymphatic gland. The patient had no obstruction of the alvine discharge, or other symptoms accompanying intestinal hernia,

but was unable to make water. She said that the swelling had often appeared, and remained protruded for two or three days, during which time she was liable to great difficulty of making water, and sometimes complete suppression, which symptoms disappeared as soon as the swelling was reduced. By the use of blood-letting and other remedies, the tumor was reduced, and a truss applied.

DIAGNOSIS OF INGUINAL HERNIA.

There are several diseases of the groin and scrotum resembling hernia, which have misled even medical practitioners, and require to be particularly noticed.

Besides the general symptoms common to hernia, that of the scrotum is usually of a pyriform shape, small at the ring, and enlarging as it descends. The patient generally recollects, that it appeared first at the upper part, and was reducible while of a small size, in the horizontal posture, and that it descended gradually downwards.

In *Hydrocele* of the tunica vaginalis, the tumor is observed to begin * at the lower part and to advance upwards, and it is in general transparent when examined by the light of a candle, and when struck by the fingers gives a sense of fluctuation,

* Sacrad and advance atlantad.

and does not increase in size when the patient coughs. When the tumor is so large as to extend through the ring into the abdomen, some little difficulty occurs in forming a diagnosis. I some time ago operated on a case of this kind. In the right side of the scrotum there was a hernia and small hydrocele; the nature of the case was evident as the hernia, though of very long standing, was quite reducible, and when protruded, a deep furrow was observed separating the hernia from the collection of water below. On the left side there was a very large hydrocele extending upwards* through the ring, and having the usual pyriform shape of scrotal hernia, but the tumor was perfectly transparent and had commenced† at the lower part. The left hydrocele was cured by injection; but soon after the cure was completed, a hernia was observed also descending on that side, the inguinal ring having been kept distended by the watery tumor, and the patient is now obliged to wear a double truss.

When water collects in the course of the spermatic cord, it may be easily distinguished from hernia, when situated below‡ the ring, by its want of connexion with the abdomen; but when it passes within§ the ring, so that its transparency and fluctuation cannot be ascertained, great caution should be used in operating.

* Atlantad. † Sacrad. ‡ Peripherad of. § Centrad of.

From *sarcocele*, hernia may be readily distinguished by the pain accompanying that disease, by the weight of the tumor, and the peculiar uneasiness excited by pressure on the testicle, which retains its form although morbidly enlarged. The inflammatory swelling, or *hernia humoralis*, is sufficiently marked by the appearance and hardness of the testicle and great tenderness to the touch, the scrotum is generally inflamed, shining, and equally distended, and we may also be guided by the previous history of the case. Ignorant persons are liable to be misled by the testicle remaining in the groin; but such a case can hardly excite any doubt in the mind of a surgeon, who gives himself the trouble of carefully examining the parts, although it may be a cause of hernia. Canestrini (*c*), a surgeon in Hungary, met with many adults in whom there was neither or only one of the testicles in the scrotum. From others he learned that their testicles had first descended in their twelfth or fourteenth year, and sometimes even not till the twentieth year of their age. From this he conceived, that, of all those in whom the testicles did not descend till after the fourteenth year, there would be scarcely one who would not be predisposed to hernia.

Hematocele, or a collection of blood in the scrotum, is generally produced by an accident. The

(*c*) Langenbeck Bibliothek für die Chirurgie, Erster Band, p. 966.

swelling is very firm, is not affected by coughing, and does not extend above* the abdominal ring, allowing the cord to be distinctly felt.

The disease, which is said to be the most(*d*) liable to be confounded with hernia, is the *varicocele*, or enlargement of the spermatic veins. In the incipient state, no difficulty occurs in the diagnosis, but when the tumor occupies the whole scrotum, it is then more obscure. The following case sent to me by Dr. Abercrombie very accurately points out the mode of distinguishing the two diseases. "An old man applied at the Dispensary, Decem- "ber 1812, affected with a tumor extending from "the groin into the scrotum. It was affected by "coughing, receded in the horizontal posture, "and appeared again in the erect. On a minute "examination, however, I found, that on making "the tumor recede in the horizontal posture, and "then raising the patient into the erect, mak- "ing accurate pressure with my hand on the ab- "dominal ring, during this change of posture "the tumor re-appeared as readily as when no "pressure was made; showing it to be the varico- "cele of the cord, and not hernia. The tumor "was knotty and unequal, and was rather longer "in proportion to its diameter than hernia usual- "ly is."

* Atlantad of.

(*d*) Mr. Cooper's Anatomy, &c. of Inguinal Hernia, p. 10.

The diagnosis of omental hernia, and of hydrocele of the spermatic cord, is particularly described in Memoir First, p. 97.

TAXIS.

In the treatment of strangulated hernia, the surgeon endeavours to discover the nature and cause of the strangulation, and to remove it; but where he is unable to ascertain these, he acts according to general rules, and employs those remedies which experience has shown to be beneficial in such cases. In all these cases, the surgeon ought to attend to the following indications in the employment of the remedies. In every case of strangulated hernia, inflammation has either already come on, or is to be apprehended. The first thing therefore to be done is to guard against it, or to remove it if it has already supervened. Secondly, every irritation affecting the alimentary canal excites spasmodic symptoms in it, as well as in the whole body, and therefore, is to be carefully prevented or removed. Obstruction of the alvine excretions is one of the most urgent symptoms in every case of strangulation, and requires particular attention. All these symptoms disappear as soon as the hernia is reduced, the principal object of the surgeon therefore is to procure the return of the protruded parts. A great deal depends upon the surgeon employing the means which he has in his

power without loss of time, as he has little to expect from nature, and the longer the strangulation has continued, the greater difficulty is met with in its removal, from the increase of the inflammation, fever, and accumulation in the bowels. Small herniæ are much more easily strangulated than large, as the pressure on the contents is more violent; and herniæ, which have appeared suddenly, are more liable to this accident than those of long standing, which have been in the habit of frequently passing * up and down.

The return of the hernia is effected by the application of the hands, which is called the TAXIS. In order to ensure its success, we must endeavour to enlarge as much as possible the cavity of the abdomen, to relax the abdominal muscles and apertures, and to place the patient in such a position, as to make the hernia the most elevated part of the body. The patient should be desired to void his urine; during the operation to avoid holding his breath or crying out, by which the abdominal muscles are drawn together, and the diaphragm forced downwards, and consequently the size of the cavity diminished.

The posture in which the patient ought to be placed not only during the taxis, but during the whole continuance of the strangulation, is the following. Supposing it is an inguinal hernia, the

* Centrad and peripherad.

patient is to be laid in the supine posture, and the head and breast well supported with pillows, that the head may be bent a little forwards. He must not sit erect or raise himself up; in general, on any change of posture he ought to be quite passive, as every exertion tends to cause a contraction of the muscles, and consequent diminution of the abdominal cavity. A pillow must also be placed under the pelvis to raise it a little higher than the head and breast, and the patient should lie a little towards the sound side. The knees of the patient are to be raised to a right angle with his body, or the thigh of the side on which the hernia is situated is to be bent inwards.

Another posture of the patient recommended by many authors, and which I have seen practised with success, is the following, called *slinging* the patient. The head and shoulders being elevated and supported, as in the preceding method, a stout assistant places himself close to the edge of the bed at the feet of the patient, in a convenient posture to avoid being soon fatigued; he bends himself a little down, draws the patient towards him, and lays his two feet over his shoulders, so that the knee joints of the patient lie upon each shoulder of the assistant, and the feet hang down his back. The assistant then raises himself slowly up, and elevates the thighs of the patient along with him, so that the patient's body hangs

down from him, and his breast and head rest upon the bed.

In ordinary cases, the surgeon performs the taxis in the following way. He grasps the hernia with the one hand, so that its bottom rests in the hollow of the hand, and the fingers are spread out singly all round: he then raises it up and presses it towards the ring, and with the fingers of the other hand tries to make it return, beginning with the part which has most recently protruded. He ought to remember, that the success of the taxis depends greatly on the diminution of the bulk of the protruded parts, and he ought to endeavour to effect that by pressing the air back into the abdomen. The pressure is to be directed from * below upwards, and at the same time from within outwards. This is the direction to be given in general to the pressure, but if it does not succeed, we ought to try it gradually in every possible direction, and even in the way in which we would the least expect it to succeed, from† above downwards, if it has failed in every other direction. If the hernia is of long standing, and before the strangulation, frequently reduced by the patient, it will be prudent to ask

* The sacral towards the atlantal aspect, and from the mesial towards the lateral.

† The atlantal towards the sacral aspect.

him by what means, and in what posture he usually succeeded in returning it, especially at times when attended with difficulty; and then to employ the same means, and in the same posture.

In order that the pressure may have the desired effect, it must at first be very moderate, gradually increased, and continued for a considerable time. The more gradually the surgeon increases the pressure, the slower he proceeds, and the longer he perseveres in it, the surer he is of success. If the pressure is at first strong and then relaxed, the hernia becomes so tender, that the patient cannot afterwards bear it to be touched, and violent pressure improperly used, has even occasioned a laceration of the protruded parts. It likewise does no good, as the bowels are pushed against the ring, in such a manner that they pass over each other in folds, and cannot be pressed through the ring. Mr. A. Cooper observes, that the longer the hernial tumor has been strangulated, the more dangerous it is to use any considerable pressure for its reduction, as the parts have then a much less power of resistance than in their natural state. The pressure should be continued from twenty minutes to half an hour, or even longer; the surgeon therefore ought to sit in a convenient situation near the patient, that he may not be fatigued.

If the taxis does not succeed in this manner, we may try it in the following way, which has

been said to be even more effectual. The pressure is to be made from every point of the circumference of the hernia towards the middle point of the tumor, by surrounding it with the hand, or if it is large, with both hands, and with the fingers spread out, so as to cover as much of the tumor as possible, and press upon its outer surface at every point. The pressure must be gentle at first, gradually increased and long continued. A great deal depends on the continuance of the pressure, and its being kept up regularly, and increased according to the benefit derived from it. Strong, sudden pressure soon becomes painful, and cannot be persevered in for a sufficient length of time. The compression, performed in this manner, is much assisted by drawing the whole tumor at the same time from the abdomen, and moving it from side to side. This mode is especially useful, when the strangulation arises from the accumulation of feces or air.

Mr. Geoghegan (*e*) of Dublin, strongly objects to the usual mode of applying the taxis. He observes, that the aperture through which the hernia passes, is in its natural state, and cannot be altered or enlarged; and the hernia is strangulated or irreducible, only because it has become enlarged and inflamed. He argues, that the

(*e*) A commentary on the treatment of ruptures, particularly in a state of strangulation.—London, 1810.

taxis can neither enlarge the one, nor lessen the bulk of the other, and must therefore be useless and unavailing: it is also dangerous, as it must excite and increase inflammation, and consequently the bulk of the protruded intestine. The only indication of cure which he admits, is to reduce the hernia to the size of which it had been previously to its having been strangulated. With this intention, all our efforts should be directed to the removal of the air and of the inflammation, and the surgeon should refrain from any attempt at pushing back the hernia. According to this view, Mr. G. recommends repose, relaxed posture, the antiphlogistic regimen, the application of cold wet cloths to the tumor, blood-letting, and the tobacco glyster. Agreeably to these ideas, he suggests the following mode of reduction: "I surround the "hernia with my hand, or hands, at about its "middle, in the way that I would grasp a gum "elastic bottle, to press out its air, or other con- "tents, by gently approximating its sides, al- "ways holding in view, that the tumor is to be "emptied, *and not pushed up*, and that a little as- "sistance to the compressing force which the "coats of the intestines are exerting, by lessen- "ing its area, even in a small degree, the air will "be strongly impelled against the part of the "tube which is closed, and through which it is "only necessary that it should obtain exit to "effect our purpose."

There is another mode which may be tried, particularly in small herniæ. The chief obstruction to the reduction in many cases lies in the ring. If the bit of gut which is seated immediately in the ring can be made to yield, the remainder of the hernia follows of itself. The ordinary pressure of the taxis upon the whole hernial tumor, has too little impression on the part which lies in the ring; but it will have much more effect on it, if we place one or two fingers on the side of the neck of the hernial sac, and press them gently and gradually into the ring. It is proper however to mention, that this method cannot be practised, when the parts lying in the ring have become inflamed and painful.

The earlier the taxis is employed after the descent of a hernia, the greater the probability of success; if the strangulation has continued for a long time, the less benefit is to be expected from it. As soon as a hernia becomes inflamed and painful, this operation increases the danger instead of removing it. There can be no doubt, that frequent, rough, and irregular repetitions of this operation, have rendered many cases of strangulation dangerous or even fatal. However, it does not follow from thence, that it ought not to be repeated after the first unsuccessful attempt. The second or even the third attempt will sometimes succeed, especially if in the interval other appropriate remedies are used, which

act against the causes and symptoms of the strangulation. These remedies often contribute very much to the success of the taxis, and in many cases it succeeds readily after their employment; and many practitioners are of opinion, that it ought not to be attempted till they have been used, especially in young and plethoric patients, when inflammatory symptoms have come on before the surgeon is called in. It will often be observed, that, if a hernia has been reduced by the taxis, the symptoms have evidently abated before the reduction, and that it is rarely reduced before such an abatement of the symptoms has taken place. In every case therefore, the taxis ought to be tried at two different times before proceeding to the operation; first, as soon as possible after the appearance of the strangulation; and a second time after the active employment of the other means to be afterwards mentioned.

An intestinal hernia, when it yields to the taxis, diminishes at first gradually, then becomes smaller and softer, and at last suddenly retires with a gurgling noise. The omental hernia never returns suddenly, but always slowly and imperceptibly, so that when it comes to the last portion, it requires to be pushed back: it is therefore always more difficult of reduction. During the reduction of an omental hernia, various uneasy sensations occur, such as painful feelings in the region of the

stomach, cramps, nausea, and faintishness, which must not make the surgeon desist from the operation, as they generally go off spontaneously, or on the exhibition of a glass of wine or some cordial. After the return of the contents, the empty hernial sac always remains in the scrotum, and occasions a greater or less degree of swelling, according to its size and density; a circumstance which the surgeon ought always to keep in mind, that he may not be deceived by the remaining tumor, and suppose that there is still a part of the hernia to be returned.

There are some cases where the taxis is quite useless or even hurtful. Old herniæ which have been kept up by a truss, when they come down and become strangulated, are not easily returned by the taxis; the neck of the hernial sac is generally contracted and indurated. It is hurtful as soon as inflammation comes on, as every pressure, however slight, increases the inflammation and the danger of mortification. And also, whenever there is reason to suspect that gangrene has already taken place, the taxis must be desisted from, as it would be dangerous if it succeeded, or its success might even prove fatal.

All the symptoms generally disappear as soon as the hernia is reduced; but sometimes they continue, and the patient is in the same danger as during the state of strangulation. The latter cir-

cumstance may arise from various causes. The symptoms of strangulation rarely cease entirely after the return of the hernia, until the patient has an evacuation of his bowels. This sometimes takes place spontaneously, at other times it must be effected by the use of purgatives. It would seem as if the part of the canal which has been confined in the hernia, had been so weakened by the distention and irritation, that it was incapable of emptying itself by its own powers. This especially occurs where the strangulation has been caused by the accumulation of feculent matter. The same cause also sometimes operates where the strangulation has been of a different nature; and even although it has depended on other causes, and although during its continuance, the patient has discharged a great quantity of feculent matter by vomiting. Richter(*f*) observes, that purgatives often evacuate so astonishing a quantity of feces, that one would actually suppose that this accumulation was produced by an increased determination to the intestinal canal, occasioned by the irritation excited by the strangulation, and that the greater number of patients are affected by a sort of gastric fever after its removal, and experience shows, that all the bad symptoms which remain after the abatement of the strangulation, are in most cases removed by the action of purgatives.

(*f*) Anfangsgründe der W. A. Kunst 5ter. B.

There are also other causes which may occasion a continuance of the symptoms. If the strangulation have subsisted for a long time, and be of an acute nature, and consequently the inflammation of the strangulated parts has proceeded very far, the inflammation does not of course disappear immediately, but often continues with violence, and requires the active employment of the antiphlogistic regimen, or even terminates in gangrene. The patient no longer labours under strangulated hernia, but a violent inflammation of the bowels.

The hernia may to outward appearances be reduced, although it is not. A small portion of intestine may still be compressed by the ring, without forming* any external tumor, and consequently pass unobserved, and if it be strangulated, may require the operation. Or the patient may have had two herniæ, the larger of which has been returned, and the smaller has been completely overlooked. If, after the reduction of the hernia, a large dose of neutral salt or glysters procure no evacuation of the bowels, if bleeding is indicated, but procures no abatement of the symptoms; if, on pressing with the finger, the abdominal ring or Poupart's ligament are not felt free; or if the patient feels pain, particularly at these parts, increased by pressure, we have reason to

* A tumor peripherad.

suppose that the cause of the continuance of the symptoms is seated in these parts.

It sometimes happens, that in returning the hernia, the bowels become entangled in such a manner as to form a stricture at some point, or preternatural adhesions or ligatures are formed, especially by the omentum, and cause a continuance of all the unfavourable symptoms. These causes are very rarely discovered till it is too late, or not till after the death of the patient. The surgeon in such cases should endeavour to procure the descent of the rupture, by making the patient stand erect, cough, and use other exertions to make it protrude, and then it is possible that the bowels may be untwisted, or the ordinary operation may be performed. It is fortunate however, that these cases are very rare, as they are always attended with much difficulty and danger. It is possible also, that the part of the intestine which has been long protruded under the ring, may have its diameter contracted by the long continued pressure, and in the event of being returned by the taxis, may prevent the passage of the feces. This case only occurs in old hernia, and is probably very rare, as the intestine, when long protruded, generally contracts adhesions to the contiguous parts, and cannot be reduced.

The last case of strangulation is the following. If a hernia has been strangulated solely by a contracted and indurated part of the neck of the sac.

and the ring is quite free and large, and has no share in the strangulation, it sometimes happens, that on using the taxis the intestine is not returned out of the sac, but the hernial sac is reduced along with its contents through the ring. This is mentioned by Prof. Scarpa to take place in small and recent hernia, and, as has been observed by Mohrenheim, when the sac is quite unattached to the surrounding parts. The hernial sac then lies in the cavity of the abdomen behind the ring, and the bowels are contained in it, and still subject to the strangulation produced by the contraction of its neck. The marks of this species of hernia are thus detailed by Richter (loc cit.) "The patient "has previously worn a truss for a long time; "which is the common cause of contractions of "the neck of the sac; the hernia returns without "the gurgling noise, if it is intestinal, and in a "mass, and not gradually and bit by bit; after "the reduction of the hernia, the scrotum is felt "unusually flaccid and emptier than usual, on ac- "count of the return of the sac, which usually re- "mains behind in the scrotum; after the reduc- "tion, the symptoms of strangulation still conti- "nue; the ring is uncommonly wide and large, "and if the finger is pressed into it, and the pa- "tient desired to cough, a tense swelling is felt "behind * it, (the full hernial sac) which strikes "against the fingers. The full reduced hernial

* Centrad of the ring.

" sac, lying * behind the ring, forms an unusual " swelling there, and on pressing upon this swel- " ling, the patient feels the same pain as he felt " before on compressing the hernia." The dangers attending the return of the sac where the strangulation is caused by its neck, are particularly pointed out at page 142 of this work.

Mr. Geoghegan(g) mentions a case of scrotal hernia, where the strangulation was independent of the aperture of the ring, but was caused by the testis being situated in the groin and acting as a plug in the aperture, by its pressure closing up the intestinal tube and impeding the circulation, thus causing the strangulation. After repeated attempts, he at last succeeded in dislodging the testicle; the hernia became diminished in size, and the strangulation yielded on the third morning after the attack.

When the return of the protruded viscera cannot be effected by the first attempts at reduction by the taxis, various remedies have been proposed which ought immediately to be resorted to. The chief of these are blood-letting and the warm bath. The bleeding, to prove beneficial, must be sudden and copious; from sixteen to twenty ounces may be taken from the arm by a large orifice; the chief object is to produce a sudden relaxation, and even

* Centrad of.

(g) Edinburgh Medical and Surgical Journal, vol. vii. p. 400.

syncope. It cannot however be laid down as a general rule to bleed the patient to syncope, as many persons suffer the loss of a very great quantity of blood without it being induced, but when that effect does supervene, the surgeon ought to take advantage of it and attempt the reduction during its continuance. Besides the benefit derived from the general relaxation produced by bleeding, as favouring the reduction, it also acts as a preventive of inflammation. Pain and tension of the hernial tumor are the symptoms usually considered as indicating the propriety of bleeding, and if the abdomen is also tense and painful, the indication is still more urgent. If the patient is young, robust, plethoric, the hernia small and recent, and the strangulation from the beginning attended with inflammatory symptoms, the bleeding ought to be performed before the pain and tension come on. We must not judge, as in other inflammatory diseases, of the necessity of this evacuation by the strength and fullness of the pulse; and we must not be deterred from its use by the coldness of the extremities, paleness of the face, and symptoms of general weakness. These symptoms are peculiar to inflammation of the bowels, and only indicate the greater urgency of the speedy employment of bleeding. The warm bath is also strongly recommended, conjoined with bleeding, or the latter operation may be performed while the patient is in the bath; and Prof. Scarpa says,

that he has repeatedly succeeded by these means. Where the warm bath cannot be conveniently employed, some relief may be obtained from the general application of warm fomentations all over the abdomen.

Another set of remedies, strongly recommended by Mr. Cooper, is the tobacco glyster, and the application of cold to the tumor. Tobacco has been used both in the form of smoke, and in infusion or decoction in water. The former mode is now generally laid aside in practice, as it requires a complicated apparatus.

The tobacco glyster has been recommended of very various strengths. Richter, Hebenstreit, and many foreign writers, direct from two drams to an ounce of tobacco infused in a pound of water to be used at once; and we can only reconcile these directions with the more cautious advice of Mr. Cooper, by supposing that the natives of these countries, from the daily use of that herb in smoking, are not so readily affected by its deleterious effects. On all occasions however, it will be most prudent to attend to the cautions suggested by Mr. Cooper. He directs a dram of tobacco to be infused in twelve ounces of boiling water for ten minutes; and as even this small quantity may produce dangerous effects, depending on the constitution of the patient, or other circumstances, he advises only one half to be thrown up at first, and the rest in half an hour, if no benefit is derived from the first portion. The effects produced by

it are great languor, quick and weak pulse, cold sweat, paleness of the face, and universal muscular relaxation; during this state the reduction should be attempted, and will frequently be found to succeed.

The other very powerful remedy is the application of cold. It may be employed either in the form of cold fomentation to the tumor, or by dashing cold water on the thighs and abdomen of the patient. When the inflammation is very great, it ought to be employed with caution. It is most useful in old herniæ where there is great distention from the disengagement of air in the alimentary canal. The most convenient form of using it, is the application of a bladder half filled with ice cold water, vinegar and water, or a solution of sal ammoniac and nitre; or a great degree of cold may be produced by the evaporation of ether. Mr. Cooper recommends a mixture of equal parts of finely pounded sal ammoniac and nitre; ten ounces of the mixed salt are to be added to sixteen ounces of water, and applied by means of a bladder. It is requisite however to observe some caution in the employment of cold, and not to continue it too long without examining the state of the parts. For the scrotum has been observed to become quite frozen, and afterwards to mortify, from the too long continued incautious use of ice. Experience having shown, that a great degree of cold is produced by the

evaporation of ether, has led to its employment in strangulated hernia. Hughes in one case of scrotal hernia used three ounces, and in another one ounce of this fluid. The effect was to cause a shrivelling of the hernia and great coldness, while the patient felt a painful heat. By this treatment, conjoined with continued gentle pressure, the hernia was at length reduced, and the patient recovered (*h*). Schmalz (*i*) relates the history of a case of inguinal hernia, where the strangulation was twice removed by this means.

Purgatives have also been employed, though they cannot be used in all cases. In *acute* or *inflammatory* strangulation they rather do harm. The frequent vomiting accompanying this species has already emptied the upper part of the canal, and they can have no effect on the stricture. They seldom reach the intestinal canal, for they are no sooner swallowed but they are instantly rejected, and their stimulus will tend to increase the inflammation. In very slight cases, after bleeding, and where there is no vomiting, they may be used with advantage. The formula used by Richter and other German surgeons is the following.

R. Sulph. Magnes. ʒi. Solv. in
Aq. Chamomillæ ʒv. adde
Olei Lini ʒii. Opii gr. ii.
Syrupi Amygdal. ʒi.

(*h*) Duncan's Med. Com. Dec. 11. vol. VII. and VIII.
(*i*) Loder's Journal, I, B. S. 681.

A table spoonful of this mixture is to be given every quarter or half hour till it has effect. The opium may be added where the stomach is very irritable. The more drastic purgatives have been recommended, in cases where the strangulation arose from the accumulation of feces, with great torpor of the peristaltic motion, especially in large old herniæ, where there are no inflammatory symptoms. Mr. Cooper recommends cathartic extract and calomel combined with opium, and Conradi employed the extract of colocynth with oily substances and opium. But if these drastic remedies are given under circumstances in which they are improper, the reduction is at least rendered more difficult, or gangrene and death even accelerated: they ought therefore always to be employed with great caution. When the reduction is accomplished, the symptoms usually cease, and the alimentary canal again becomes pervious, and the exhibition of a saline purgative generally produces a free discharge of feculent matter. If the symptoms continue after the reduction, the antiphlogistic regimen is to be persisted in, and the patient is to be treated as labouring under inflammation of the abdominal viscera.

If the viscera cannot be reduced by the employment of the means pointed out, the only resource is the operation, and the sooner it is performed after the methods recommended have failed, and after the appearance of the symptoms of stran-

gulation, the greater is the chance of saving the life of the patient. The most eminent writers on the subject of hernia, strongly recommend an early operation, and the point is fully discussed at page 291 of this work.

OPERATION FOR INGUINAL AND SCROTAL HERNIA.

The operation being resolved upon, the hair must be shaved from the tumor and neighbouring parts, the patient is to be laid on a table of convenient height, or brought to the edge of the bed, lying nearly in the same posture as when the taxis is performed, his breast and head being raised, and a pillow put under his hips, his feet hanging over the bed; the foot of the side to be operated on, should rest on a chair, that the thigh may be kept in a half bent posture. The surgeon should be seated between the legs of the patient. This being arranged, and a sufficient number of assistants procured, the operator grasps the tumor firmly with the left hand, and with a common scalpel makes an incision through the skin and cellular membrane, the whole length of the tumor beginning about an inch * above the ring. If the tumor be very large, it is not requisite to carry the incision to the bottom of the scrotum, as it would occasion a wound of unnecessary size. When any

* Atlantad of.

arteries are divided, it is better to secure them before going farther; this incision lays bare the fascia of the external oblique, which is to be divided with the hand unsupported, or on a director to the same extent as the first incision; after this, in the same manner the cremaster muscle and cellular sheath, proceeding with caution as we advance, to avoid rashly cutting through the proper sac of the hernia. When it is laid bare, it may be readily distinguished by a sort of blueish appearance, and by its transparency. It should be opened at its * anterior and lower part, as the viscera frequently do not descend to the bottom of the sac, and if any fluid is collected, it guards the viscera from injury. A portion of it is to be raised with a pair of dissecting forceps or the fingers, and a small opening is to be made in it with the edge of the knife, holding it horizontally; this opening should be made merely of such a size, as to admit the point of a blunt director, on which the sac is to be divided upwards, to within an inch of the ring, with a probe-pointed bistoury. As soon as the opening is so large as to admit the point of the finger, it should be substituted for the director, as the sac may be divided with greater safety, carrying the knife along it. We are next to proceed to examine the seat of the stricture, and if it cannot be removed by dila-

* Sternal and sacral aspect.

tation, it is to be divided in the manner so accurately described by Prof. Scarpa in the Second Memoir, p. 126, et seq.

The viscera being now freed from the stricture, they are to be carefully examined, to ascertain whether they are in a state proper to be returned into the abdomen. When this is confirmed by careful examination, Mr Travers (*i*) observes, "there are two points of importance to be kept "in mind. The first is, the evacuation of the "gut by gentle but continued pressure, before at- "tempting to return it, for which purpose, a mo- "derate dilatation of the stricture will suffice. "The second, is the orderly and complete replace- "ment of it, passing from one extremity of the "loop to the other. Whether the gut or pro- "truded omentum is first returned, seems to me "a matter of less consequence. On the obser- "vance of order in the return of the bowel I have "before insisted: its return in a state of collapse, "not only materially reduces the requisite extent "of dilatation, but by relieving its overstretched "fibres, gives it a fairer chance of recovering its "contractile tone. The idea which best conveys "my notion on this subject is, that after the ex- "posure of the bowel, the operator should con- "tinue to act on the principle of the taxis." The management of the viscera when mortified has

(*i*) Oper. cit. p. 247.

already been so fully explained, that it is unnecessary to offer any farther remarks on that subject; it is proper however to observe, that the author's directions are strongly supported by the conclusions drawn by Mr. Travers, from his very accurate observations and cases. The facts stated in his work are of such importance, as to induce me to refer to the work itself, as they cannot be abridged without injury to the author's discernment and judicious instructions, and will fully compensate the trouble of perusing the work.

Bertrandi (*k*) directs the fold of intestine to be drawn a little more outwards before returning it. This advice is of importance, because it often enables the gut to be more easily reduced, and allows the state of the strangulated portion to be more completely examined.

The operation being finished, the lips of the external wound are to be closed, and kept in contact by means of the interrupted suture and adhesive plasters, covered by compresses of lint supported by the T. bandage.

TREATMENT AFTER THE OPERATION.

After the return of the bowel, the first circumstance requiring attention is the evacuation of the canal, as the symptoms of strangulation conti-

(*k*) Trattato delle operazioni di chirurgia, tom. I.

nue until that is procured. If no evacuation takes place in half an hour, an emollient oily glyster should be thrown up, and repeated every hour or half hour, according to the urgency of the symptoms, and as soon as the nausea and tendency to vomit have abated, small doses of the purgative mixture, reccommended when speaking of the taxis, are to be given; or the sulphate of magnesia alone in doses of half an ounce dissolved in infusion of roses, repeated every hour till stools are procured. If symptoms of peritoneal inflammation occur, venesection is required, but it can have no effect in assisting the unloading of the bowels, although when evacuations are obtained, it is almost always necessary, and the cure often depends on its active employment. Warm fomentations should be applied over the whole abdomen, and in cases of slow strangulation, in old persons, cordials are often required, with light nourishment if the strength is much exhausted. I have also met with cases where blisters were useful, if the pain be circumscribed. The patient ought to observe a very strict regimen for a considerable time after the operation, and avoid all violent exertions, indigestible food, exposure to cold, &c. as errors in these respects, even a very long time after, may occasion fatal symptoms, which in all probability are ascribable to the contraction which has taken place in the bowels dur-

ing their strangulation. The propriety of wearing a truss has already been pointed out.

OF FEMORAL HERNIA.

The investigations which have of late years been made in the anatomy of femoral hernia, whilst they have certainly added to our minute knowledge on the subject, have been equally fruitful in magnifying the importance of some points; and by complex description, and an aim at too great minuteness, have involved in a maze of obscurity a piece of anatomical structure, which is in itself simple. The insatiable desire which several anatomists of the present day have shown to multiply fasciæ, has at last been carried so far, and indulged to such a degree, that it appears as if no one believed himself entitled to any claim of excellence, unless he had added one to the list. Dr. Barclay and Mr. Fyfe have repeatedly complained, that they had less trouble in demonstrating the natural structure of these parts, in the manner of Scarpa, than in manufacturing new forms with the knife, to explain to their pupils what is meant by these fasciæ. In the same manner, in describing the part of the femoral arch, which in general is the cause of strangulation in femoral hernia, a variety of denominations have been introduced, calculated to mislead young students, by representing this part as a se-

parate ligament, when in reality, it is only a portion of the femoral arch or fallopian ligament. It has been called by the late Mr. A. Burns of Glasgow, the *crescentic arch;* the *femoral ligament* by Mr. Hey, and from having been first accurately described by Gimbernat, a celebrated Spanish surgeon, many authors have given it the name of *Gimbernat's ligament.* A continuation of this duplicature described by Gimbernat, which turns outwards, has been called by Mr. Burns the *falciform process*, and it is this part which he recommends to be divided in the operation for strangulated femoral hernia, as he observed, that its division relaxes the crural arch as much as the cutting of the *crescentic* fold at the pubes. It is necessary that students should be acquainted with these terms, that they may be enabled to understand the description of the authors, although they may be considered as objectionable from the risk of leading them to suppose that they are distinct parts of the fallopian ligament.

The anatomical description of Prof. Scarpa is so plain and simple, and as his mode of dividing the stricture coincides with that of Gimbernat, I think it unnecessary to offer any remarks on that point; those who wish for a further account may consult the works of Mr. Laurence, Cooper, Gimbernat, Dr. Monro, jun. &c.

A very important variety of femoral hernia, which has not been noticed by Prof. Scarpa, is

where the obturator artery comes off in a common trunk with the epigastric, and passes round he hernial sac. This distribution of the arteries is by no means unusual; but in general, the common trunk is so short, that the obturator passes behind the sac. There is no artery more irregular in its origin; its situation with regard to femoral hernia is thus accurately described by Dr. Barclay (*m*). "In crural hernia, the obturatoria "from the epigastric has been seen running round "the neck of the sac on the sternal aspect. Dr. "Monro, when he lately published on morbid ana- "tomy, imagined this circumstance had been first "noticed by Mr. James Wardrop. In Britain, I "believe it was first noticed in that preparation "of which Dr. Saunders has in his Thesis, and "Mr. Cooper, in the second part of his work upon "herniæ, given a figure. The preparation was "made from a subject which I had been demon- "strating publicly in my class; was injected and "dissected by my then assistant Mr. John Dick- "son, now a surgeon in the Royal Navy. Mr. "Cooper, with a laudable attention to accuracy, "declined to publish an account of it from a draw- "ing, and accordingly the preparation was sent "to him at the request of my friend Mr. War- "drop."

(*m*) Description of the arteries of the human body, p. 237.

" As the origin and course of the obturatoria, " with relation to the sac in crural hernia, and of " the epigastric, in relation to the sac in both the " inguinal and crural hernia, can never be very " precisely ascertained, previous to actual exami- " nation, the only general rule to be given for " avoiding these branches in the operation is, " when near the situations where they have been " or possibly may be, to examine every part be- " fore it is divided, and to divide none that has " not been examined with the utmost attention."

The danger of wounding this artery in femoral hernia, is noticed by Penchienati and Brugnone (*n*). Mr. Wardrop, in the account of his case inserted in the Edinburgh Medical Journal, remarks, " that " the artery and vein formed nearly a complete " ring round the mouth of the hernial sac." And farther, " It ought also to be remarked, that the " relative situation of the hernial sac and obtura- " tor artery, will always vary in proportion to the " length of the trunk common to it and the epi- " gastric artery. If the trunk is short, the artery " will pass round the mouth of the sac; if it is " longer, it will be found on the outer and poste- " rior part of the sac."

It is difficult to form an estimate of the frequency of this variety of femoral hernia. Dr. Monro

(*n*) Bertrandi delle operazioni di chirurgia colle note dei chirurgi Penchienati e Brugnone. Turino 1802.

jun. says, that according to his observations, it does not occur in above one of twenty-five or thirty cases. Dr. Thomson of Edinburgh, observes, that he had found such a distribution of the obturator artery in six out of ten preparations of hernia he had examined; and Mr. Wardrop remarks, that this distribution of the vessels had occurred in a considerable proportion of the subjects he had dissected. Mr. Lawrence is of opinion, that this artery would be endangered only once in eighty or a hundred operations; and with regard to the mode of operating, he remarks, that "the risk is "not sufficient to induce us to exchange this "(the division of the stricture as near as possible "to the pubes) for any other mode that has been "hitherto proposed; as I know of none which "avoids the vessel more certainly, while in faci-"lity of execution, and in other advantages, this "has the undoubted preference (*p*)." It is proper to remark, that whatever be the course of this artery, and in every operation for femoral hernia, the object of the surgeon ought to be to divide the part forming the stricture, and preventing the return of the strangulated intestine; if this only is divided, it is of little importance in what direction the incision is made, remembering always that a very slight cut, or merely a few scratches, are all that is required.

(*p*) A treatise on ruptures, &c. p. 381.

DIAGNOSIS.

In most cases femoral hernia is strongly marked, so that at first sight it would appear not liable to be confounded with other diseases. However, numerous instances of error are recorded to have happened even to the most skilful surgeons. This principally occurs in small femoral hernia, where the protruded parts are concealed by an enlarged lymphatic gland, or by a steatomatous or hydatid tumor. Examples of this are met with in the works of Morgagni, Saviard, Sabatier, and a very remarkable case is related by Adolphus Murray (*o*). In such cases, it is of great importance to attend to the history of the case, as the patient is often not aware of the nature of his disease, or endeavours to conceal it.

Psoas abscess is also liable to be mistaken for femoral hernia, when the matter presents under Poupart's ligament; the tumor occupies the same situation, is increased in size by coughing, and is diminished on the patient being placed in a horizontal posture. It may be distinguished from hernia by the tumor being more diffused, and by the sense of fluctuation, and there is almost always a considerable derangement of the general

(*o*) Animadvers. in hern. incomplet. casu singulari illust. Ups. 1788.

health of the patient, preceded by great weakness or pain in the lumbar region.

The mode of using the taxis in femoral hernia is very accurately described in a note on the Fourth Memoir, p. 288. When it fails of success, the same remedies are to be employed as have been already mentioned, when speaking of inguinal hernia. These are bleeding and the warm bath; cold applications to the hernia, and the tobacco glyster. The operation ought rarely to be delayed longer than is necessary to allow a trial of these means; it is particularly described in the Third Memoir, and after it the same general plan of treatment is to be attended to, as after the operation for inguinal hernia.

OF HERNIÆ OF THE PERINEUM, OF THE FORAMEN OBTURATORIUM, OF THE VAGINA, AND OF THE SACROSCIATIC NOTCH.

The convolutions of the ileum not only occupy the lateral parts of the umbilical and iliac regions, but also the superior part of the pelvis, called by some anatomists the *great* pelvis; the other portion of the pelvis which is below * the brim, is called the *small* pelvis. The peritoneum after lining the † internal surface of the abdominal muscles, on

* Sacrad of. † Central.

reaching the superior * margin of the pubes, turns a little over the pubes and the urinary bladder, and then extends and spreads over the fundus of the bladder from before backwards †, and in the male is reflected upwards ‡, between the posterior § surface of this viscus and the anterior ‖ surface of the rectum. From this it again ascends, extending itself anterior to ¶ the psoas muscles, and to the lumbar vertebræ, which are situated behind ** it, as well as the ureters, the kidneys, the spermatic vessels, the aorta, and vena cava. In the female, from the fundus of the bladder, it passes between it and the anterior †† surface of the uterus, from thence it re-ascends to cover its fundus, and again descends between it and the rectum, and then re-ascends as has been mentioned of the male.

From this description it is evident, that the peritoneum from the pubes to the os sacrum forms a sort of diaphragm, separating the general cavity of the abdomen containing the intestines from that of the pelvis, in which are contained the urinary bladder, the uterus and the rectum; but at the same time it may be observed, that this diaphragm forms duplicatures of different sizes, and more or less loose, between the folds of which it is not impossible that the ileum may be insinuat-

* Atlantal. † The sternal aspect, dorsad. ‡ Atlantad.
§ Dorsal aspect. ‖ Sternal aspect. ¶ Sternad of.
** Dorsad of. †† Sternal aspect.

ed, which on these folds being dilated may descend into the small pelvis, and form in these places a hernia presenting a greater or smaller tumor externally *. In the male, there are two spaces corresponding to the above mentioned duplicatures, capable of permitting the formation of hernia, the one between the internal † surface of the pubes, and the anterior ‡ surface of the bladder; the other between its posterior § surface, and the anterior surface of the rectum. In the female, besides these two spaces, there is a third between the urinary bladder and the uterus.

Suppose therefore, that the small intestines, from whatever cause have passed between the two laminæ of the small duplicature of the peritoneum, situated between the arch of the pubes and the bladder, they may there form a hernia protruding through the *foramen obturatorium*. This opening indeed is for the most part closed by the obturator muscles, by an aponeurotic membrane spread over the obturator *internus*, and by the levator muscles of the anus; but towards its upper || margin there is left an oblique space, corresponding to a small depression in the os ischium, which is not covered by these parts, as it allows a passage to the obturator vessels and nerves. In this space therefore, where the muscles and this mem-

* Peripherad. † Central. ‡ Sternal. § Dorsal.
|| Atlantal.

brane are wanting, the intestine may gradually insinuate itself with the relaxed peritoneum, and form a tumor appearing externally *.

This hernia was first observed by Arnaud, who communicated his remarks to Garengeot. Duverney, in dissecting a body found two herniæ, one protruding at each foramen: the first author who mentioned it publicly was Reneaulme de Taranne, a physician of Paris (*q*); he however expressed doubts about its existence. Garengeot (*r*) afterwards published several cases of it, and since that time every writer on hernia has mentioned it, and the number of cases has increased.

This hernia has been observed more frequently in the female than in the male, perhaps, because in the former the ossa innominata are wider, and the aperture left in the foramen obturatorium by the obturator muscles, is larger. It is generally formed by intestine, though the omentum has sometimes been found in it.

The tumor formed by the hernia of the *foramen obturatorium*, appears at the upper † and internal part of the thigh contiguous to the perineum in the male, and in the labia pudendi of the female; it is sometimes round and small, sometimes larger, and extending towards the middle of the thigh. Its

* Peripherad. † Proximal and tibial.

(*q*) Traité des hernies. Paris 1725, in 12. p. 95.

(*r*) Memoires de l'Acad. de chirurg. T. 1.

precise situation is between the two smaller heads of the *triceps* muscle, and the *pectineus*, and these muscles are more or less separated, according to the greater or smaller size of the tumor. If the hernia becomes strangulated, the patient feels pain in that part, passing into the pelvis, towards the groin, and afterwards over the whole abdomen, with bilious vomiting, and even vomiting of feculent matter, with constipation, but there is no tension of the abdomen.

To reduce this hernia, the patient is to be laid in the horizontal posture, as has been mentioned in speaking of the taxis of inguinal hernia. In this case however, the thighs ought to be still more bent and separated from each other, and the lumbar region more raised by means of pillows placed under the hips; then by gentle and alternate pressure of the fingers, directed obliquely from below * upwards, the protruded parts are to be returned into the abdomen.

After the parts are returned, a pad made of old linen is to be applied upon the cavity left by the hernia, and over it several triangular compresses, supported by the simple *spica* bandage, which ought to be worn for thirty days or longer, and at first, the patient should be kept in bed on a low diet, using occasionally an emollient or laxative glyster. The bandage should be renewed

* The sacral aspect atlantad.

every four or five days, not only in order to tighten it, if it has become loose, but to remove all moisture which might excoriate and inflame the parts.

Sue (*s*) proposed a truss for this hernia, the circular part of which should be stronger than usual, and the fixed point to press on the ossa innominata; he directed that the pad should be soft and elastic, with a spring about five or six finger's breadth in length. The pad ought to have two blunt hooks, placed in an oblique and opposite direction; the one of these hooks, towards the lower * part of the pad, has the point turned upwards † to receive the end of the *thigh* strap; the other, placed towards the ‡ upper and external part of the pad, has its point turned downwards §, to which is fastened the end of the circular strap. Pipelet (*t*) improved this bandage by means of a screw, with which the patient could at pleasure increase or diminish the pressure.

Malaval (*u*) observed in a girl an entero-epiplocele of the left *foramen obturatorium;* he could easily return the intestine, but could not reduce the omentum, and Arnaud, to whom he sent this patient, had no better success; the latter therefore resolved to perform the operation, which was done in

(*s*) Traité des bandages, Paris, 1746.

(*t*) Memoires de l'acad. de chirurg. tom. cit.

(*u*) See the Dissertation of Garengeot.

* Sacral. † Atlantad. ‡ Atlantal and lateral § Sacrad.

the following manner. The intestine being reduced, he made a longitudinal incision in the integuments, and having laid bare the sac, he opened it in the same direction. Within it he found a portion of omentum as large as a nut, protruding outwardly*; he cut it away, and pushed the remaining part into the abdomen; the wound was dressed with compresses and a proper bandage, and in a short time the patient was completely cured.

Bromfield, in performing the lateral operation for stone in a boy, was astonished on observing a fold of small intestine protrude through the wound of the integuments of the perineum. This prolapsus of the intestine was caused by a wound of the peritoneum separating the cavity of the abdomen from the pelvis, that membrane having been forced down† along with the intestines during a violent inspiration, towards the bottom of the pelvis, and insinuated between the urinary bladder and the rectum.

This case of Bromfield's proves sufficiently the possibility in the male of the intestinal hernia in the *perineum*, and it is not difficult to understand how from the above mentioned cause, or other similar accidents, the small intestine, and even the omentum, may rupture or dilate the large fold formed by the peritoneum between the bladder and the rectum. The swelling in the perineum is of an elongated form from the anus to the scrotum;

* Peripherad. † Sacrad.

it may be discovered to be a hernia, by the proper characteristic symptoms of herniæ, especially if it should become strangulated, which however rarely happens.

The *perineal* hernia has been observed by Duverney and the younger Pipelet, and the latter describes a particular bandage for retaining it. It consists of a circular passed round the body, from the posterior* part, as in the T bandage, an elastic plate descends having an ivory button attached to it at the place corresponding to the perineum, where the hernia protrudes. Perhaps it might be sufficicient to use a pad made of old linen retained by a *crucial* bandage, the two† anterior extremities of which might be fastened to the circular in the groins, and the posterior‡ on each side of the os sacrum.

The *Ischiatic* hernia, is that formed by the protrusion of the viscera through the foramen formed by the sacro-sciatic ligaments, and by the great notch. Bertrandi(*x*) observed this hernia twice in the dead subject, and in both cases on the right side. It has been rarely observed before death, so that it is difficult to give any account of the diagnostic symptoms; this may arise perhaps from the great thickness of the glutæus muscle preventing

* Dorsal. † Sternal. ‡ Dorsal.

(*x*) Opere anatomiche e cerusiche, tomo 1. p. 51. parte prima.

the tumor being felt. Verdier (*y*) mentions a case where the tumor extended from the anus to the middle of the leg. "After death it was disco-" vered to be a hernia containing not only a por-" tion of the omentum, the jejunum and ileum," with the mesentery, but also the cæcum, the" lower portion of the colon, with a portion of the" rectum. These parts had passed out by one of" the lateral openings of the pelvis called scia-" tic notches, sliding over the sacro-sciatic liga-" ments; the stomach occupied the middle of" the abdomen; it was situated longitudinally," and the duodenum approached towards the ori-" fice of the hernial sac."

Women are particularly subject to the descent of the intestine or omentum, or of both, forming a tumor in the parietes of the vagina, by which the protruded parts are covered; they have therefore been called *vaginal* hernia. Garengeot (*z*), who was the first who published a case of intestinal vaginal hernia in a pregnant woman, thus explains the mode of its formation. "These pa-" rietes (of the vagina) being strained in lying-in," and constantly moistened with the fluid which" lubricates them, sometimes stretch and relax so" much, that the few fleshy fibres which enter in-" to their formation, separate and collect into" bundles. There only remains, opposite to these

(*y*) Mémoires de l'acad. R. de chirurg. T. IV. 12mo. p. 2.

(*z*) Ibid, T. III. p. 349.

" spaces which the fibrous bundles leave between " each other, the membranous parts of the vagina " which are not capable of much resistance." But he does not mention how these viscera in the healthy state, removed to such a distance, and separated by a strong membranous partition, reach the vagina. Whoever reflects upon the three duplicatures, which in the female the peritoneum forms between the arch of the pubes and the bladder, between the latter and the uterus, and between the uterus and the rectum, will have no difficulty in understanding, that these are so many ways through which the viscera may descend and form a tumor in the parietes of the vagina. The hernia forms more readily through the two latter than the former, because the space is much larger, the peritoneum naturally covering a large portion of the vagina, besides the corresponding surfaces of the bladder, uterus, and intestine.

There are some symptoms common to polypus of the vagina and hernia; in both there is a tumor of a larger or smaller size, painful or indolent, the base of which is sometimes narrower than the rest, and occupies some part of the vagina. But in the hernia of the vagina the orifice of the uterus may be felt situated obliquely, because in that case the uterus is always drawn more or less to the opposite side; the hernial tumor is always at the lateral parts of this passage and yielding, and by pressing on it, it may be made to disappear partly or entirely. In intestinal hernia, it

generally disappears entirely with a gurgling noise; in the omental hernia, the tumor is unequal, not hard however, but slippery and irreducible, because it is almost never possible to return it; in the mixed hernia, the tumor is partly smooth, equal and yielding, partly unequal, slippery, and on pressure diminishes in bulk, but does not entirely disappear. This hernia, whatever be its contents, at first always occupies the lateral and upper* part of the vagina; in process of time, if it is neglected, it fills the whole passage, and even protrudes outwards, distending the one or other of the great labia. The patient is occasionally affected with pains of the abdomen, which always begin in the seat of the tumor; to these are added not unfrequently, nausea, vomiting, and dragging at the stomach; and Dr. John Sims mentions, that in all the cases he had met with, the patient suffered much from a constant painful sensation of bearing down. Garengeot's patient could not make water except when lying on her back, probably because the tumor compressed the bladder in any other position. Herniæ of the vagina are best retained by a common well adapted pessary.

OF HERNIA OF THE URINARY BLADDER.

The bladder may be displaced, passing through the inguinal ring, under the femoral arch, through

* Atlantal.

the umbilicus, the perineum, and in women in particular, appearing in the parietes of the vagina. This hernia is almost always *incomplete*, (p. 453.) because the whole body of the viscus can with difficulty be removed, and it is only a portion of it which is elongated and tumid.

In the hernia of all the other viscera hitherto described, it has been shown, that the peritoneum, if it has not been ruptured, always relaxes and is elongated into a sac, within which are contained the protruded parts; but in the hernia of the urinary bladder, there is no hernial sac, because the peritoneum, as has been already explained, only covers its fundus, and a portion of its posterior * surface, and the hernia never begins to form from the neck to the fundus, but either anteriorly † or at its lateral or superior part; the portion of it therefore which is elongated, is not covered by peritoneum.

Mery (*a*) having observed, that in all the herniæ of the bladder he had met with, its shape was very different from the natural form, supposed that these herniæ always depended on a congenital defect of its structure. But besides, as it appears from the cases on record, that it often begins at an advanced age or in the adult, where there was previously no suspicion of it, if we reflect upon the situation of this viscus, and the par-

* Dorsal. † Sternad.

(*a*) Acad. R. des sciences, Paris, an. 1713.

ticular structure of its muscular coat, it will be easy to understand, that by the irregular and disproportionate pressure to which it is exposed during the different stages of pregnancy, or in cases of constipation, some portions of it may be more distended by the urine accumulated, and in process of time may form elongations, although it was originally well formed.

The hernia of the bladder, in the male, more frequently protrudes through the inguinal ring, and in the female under the femoral arch, in consequence of the different size of these apertures in the two sexes. It has always been observed in both cases, that the portion of the bladder contained in the hernia was an elongation resembling a thin fold of intestine, and formed by the lateral, anterior *, or middle parts of its body. In the female, there have often been observed two herniæ, one on each side, as is mentioned by Verdier, by Penchienati and Brugnone. In the male, where this hernia takes place, the patients have in general been affected with retention of urine or costiveness.

In pregnant women, the bladder compressed between the arch of the pubes and the uterus, is as it were flattened, which obliges it to extend laterally, and in fact, in all women who have had many children, it acquires a flattened figure and is almost *bicornis*. It sometimes happens therefore,

* Sternal.

that the gravid uterus, continuing to compress this sac unequally and forcibly, and preventing the free and easy discharge of the urine, at last elongates the one or other side, or both, into a sacculated appendix, which then insinuates itself either into the inguinal ring or under the femoral arch, forming a larger or smaller tumor. In the case which I met with, the tumor was not much larger than a common nut, and very deep-seated. The bladder also sometimes protrudes in the perineum, and frequently in the vagina.

Sandifort (*b*) relates the following case of hernia of the bladder in the female. The patient, a young woman about twenty-five years of age, after a convulsive cough, was attacked by a suppression of urine, attended by very painful swelling and tension of the abdomen, which was indeed readily removed by the catheter, but frequently returned, and was always accompanied by the spasmodic cough. As during the attacks of this suppression of urine, very slight swelling was observed above the pubes, and the patient complained of a sense of weight in the vagina, and as the catheter was always introduced with difficulty, an examination *per vaginam* was made during one of the attacks, and a tumor was discovered at its upper* and posterior part, in which fluctuation was felt. On pressing it with the finger, the patient felt a desire to make water. As soon as the bladder was emptied,

(*b*) Observ. anat. patholog.

* Atlantal and dorsal aspect.

the tumor disappeared, and the upper* part of the vagina became quite flaccid. The convulsive cough was evidently the cause of this hernia. The patient wore a cylindrical pessary for several years, which removed all the inconveniences of the disease, and a complete and radical cure was effected.

Although in general there is no peritoneal sac covering the hernia of the urinary bladder, it sometimes happens, that there is a hernial sac in very large femoral or scrotal *cystic* hernia, but it is different from that of the other viscera. If the hernia continues to increase in size, the lateral or anterior† part of the body of the bladder may draw its fundus through the ring or under the femoral arch, and along with it the peritoneum which is stretched over it; in this case, the peritoneum thus elongated forms a sac, but an empty sac, covering the tumor formed by the bladder, which is consequently without the sac. And as the urachus and umbilical arteries must of necessity be relaxed to allow this displacement, therefore, in such herniæ these ligaments are found along with the bladder, covered by the elongation of the peritoneum; and Verdier mentions a case, where during a violent exertion, the urachus was ruptured in one of these herniæ.

The most certain marks of the *cystic* hernia, wherever it occurs, are not merely the softness and

* Atlantal. † Sternal.

fluctuation of the tumor, but its diminution and even total disappearance when compressed, the patient feeling a desire to make water, and doing so in proportion to the pressure. The tumor returns and increases gradually the longer he retains his urine, and he has always more or less difficulty in discharging it, and in general it is necessary to compress or raise the tumor, or to place himself in a particular posture.

The inguinal and femoral *cystocele*, when they are recent, begin with slight swelling in these parts, soft and yielding, not painful, with evident fluctuation, appearing only when the bladder is full of urine, and usually disappearing when it is empty; for, if the tumor is compressed, the patient suddenly feels the desire to make water, and it continues to flow till the tumor diminishes, or at last totally disappears of itself. But if the hernia is of long standing, it then extends more down into the scrotum, or along the thigh in the male, and towards the great labia pudendi of the female; there is always in this case dysuria more or less severe, with pains in the perineum and loins; when the patient wishes to make water, he must raise the scrotum with his hands, or compress the tumor if it is a femoral hernia; sometimes he can make it best lying on his back, or on the opposite side to the hernia. The *cystocele* of the perineum, &c. is distinguished by the same symptoms; in the former, when the patient

wishes to make water, he is obliged to stoop and incline the body forwards, at the same time that he compresses the tumor by applying the fingers to the perineum and vicinity of the anus, pressing it in different directions.

The scrotal and femoral hernia of the bladder may become strangulated, so that the portion of the bladder displaced, has no longer any communication with that remaining in the pelvis. In such a case, as in herniæ of the other viscera, there usually supervene pain and tension of the abdomen, hiccup, vomiting and fever, which symptoms may occasion some ambiguity with regard to the nature of the disease; but in the cystocele, these symptoms, as in the other cases, do not spread over the whole abdomen, and they do not sympathise with the stomach, but extend only into the pelvis, to the perineum, along the penis and to the loins; the hiccup usually precedes the vomiting, which never consists of feculent matter, and there is always a greater or less difficulty of making water.

The diagnosis is still more difficult if the hernia is *compound*, that is, an omental or intestinal hernia combined with the *cystocele*. The tumor formed by the former being always, as has been mentioned, before that formed by the bladder, the fluctuation of the urine can with difficulty be felt, or the patient be made to make water when the tumor is compressed or raised; but the previous

history and the present symptoms will remove all doubt.

There are cases on record, that one or more stones have been contained in the *cystic* hernia formed in the groin, scrotum, or any other part. In this case, if the stones are small and moveable, they may be easily distinguished by their hardness and mobility, and they may sometimes even be made to return into the portion of the bladder remaining in the pelvis, from which they pass out by the urethra. But if there are many calculi of a larger size, and adhering, the hardness and inequality of the tumor may produce some confusion in the diagnosis, as these symptoms might be supposed to be caused by indurated feculent matter in an intestinal hernia, or by the omentum becoming schirrous in an omental hernia, especially if these calculi occasion strangulation, by preventing the communication between the healthy and the hernial portion of the bladder.

Bertrandi (*c*) relates the following case of hernia of the bladder, with calcareous incrustation. "Vidi porro ego herniam vesicæ urinariæ, cujus "transitus per annulum musculorum abdominis "ita fuerat coarctatus, et obstructus, ut nisi per- "fracto tartareo quodam cœmento tenuem stilum "trajicere possemus. Saccus qui vesiculæ felleæ

(*c*) Opere anatomiche e cerusiche. T. II. De Hydrocele, p. XIII.

" figuram, et magnitudinem æquabat, tartarea,
" seu calculosa materia intus per intervalla ob-
" ductus observabatur, atque paucæ humoris sub-
" rubri viscidi graveolentis drachmæ in vacuo
" continebantur."

The recent *cystic* hernia formed at the ring or under the femoral arch, is in general easily and radically cured, provided the patient is young and healthy, and does not follow a business obliging him to raise heavy weights, or make violent exertions; that of the perineum in pregnant women is cured spontaneously after delivery, although it not unfrequently returns in a future pregnancy. The hernia of the perineum in the male and of the vagina in the female, for the most part, only admit of a palliative cure.

The cure of the *cystocele*, as of every other hernia, is effected by the reduction, if it is possible, and the application of a proper truss to prevent the return; or we must support it, and prevent its increase if it is irreducible. The incipient inguinal and femoral herniæ, almost always disappear spontaneously when the bladder is emptied, and their return may be prevented merely by wearing constantly a truss, similar to what is used in other inguinal or femoral herniæ. The scrotal *cystocele*, as it is generally more or less adherent, ought to be supported by a *suspensory*, which should be applied when the sac is completely or nearly empty; it is to be made of strong cotton,

and its cavity adapted to the particular figure of the tumor, and it should be rather smaller than it. The patient should remain in bed for a considerable time, always lying on the side opposite to the hernia; he should drink little, and particularly abstain from diuretic liquids; he should make water frequently, and even excite the desire by compressing the tumor.

If from the symptoms formerly mentioned, the hernia appears to be strangulated, it has been recommended to puncture the protruded portion of bladder with a trocar. Verdier mentions, that Morand performed that operation with success. For, after the evacuation of the stagnant urine, it will be easier to remove the incipient inflammation by blood-letting, emollients, low diet, and the antiphlogistic regimen, if the strangulation depends on it. But if the use of these means does not procure a speedy abatement of the symptoms, we must not hesitate before the appearance of gangrene, to dilate the ring or the femoral arch, by performing the operation in the same way as in the incarcerated inguinal or femoral hernia of the other viscera; only in this case, it is necessary to guard against wounding the sac. If the strangulation proceed from calculi, or from calculous incrustations collected at the mouth of the portion of bladder contained in the hernia, this portion ought to be opened, in order to extract the calculi or incrustations: it would be better to follow

the same practice, although the calculi were not the cause of strangulation, and although it had not come on, because if they were pushed back into the bladder, it would necessarily subject the patient to a more dangerous operation, in order to remove the stone.

Whenever it is necessary to puncture the *cystic* hernia, it is of importance to keep a flexible catheter in the bladder by the urethra, in order that the urine may be determined by the natural way, to prevent a fistula in the groin. The catheter ought to be withdrawn and cleaned every four or five days, to prevent it becoming incrusted with calculous matter. The hernia of the bladder which forms in the perineum, requires the same bandage or truss which has been proposed for other herniæ of the same part.

Stoll(*e*) mentions a case of *congenital* hernia of the bladder, in a child fifteen months old; there was a scrotal hernia on each side, and a tumor above the os pubis, of which he gives the following account. " Supra ossa pubis tumor, dimidiatum gal-
" linæ ovum magnitudine æquans, subrotundus; re
" accurate examinata constitit, esse vesicam uri-
" nariam, aut ejus saltem quamdam partem, quæ
" inter musculos abdominis rectos, a se invicem
" dimotos, supra ossa pubis herniose prodiit. Hæc
" vesicæ hernia pariter fuerat congenita."

(*e*) Ratio medendi, tom. 3. p. 429.

M. Cayol, the French translator, mentions a case of scrotal hernia accompanied with all the symptoms of strangulation, and where even the integuments had become red and livid, yet they afterwards recovered their natural colour, and all the local symptoms disappeared. The unhappy patient, who survived five months, tortured with borborygmi, violent colics, and occasional diarrhœa, at last died suddenly; and upon the inspection of the body, it appeared, that the loop of intestine in the hernial sac had been actually gangrened, and that this gangrened part had been entirely removed, the separated portions being evidently united at one part by a cicatrix, and at another through the medium of the surrounding parts. The atlantal portion of the intestine, it appeared, had discharged its contents into a cul-de-sac, formed of part of the hernial sac, of the omentum and cellular membrane, and from this sac the contents were conveyed into the orifice leading to the rectum. Cayol supposes that the gangrened portion of the intestine had been discharged by stool, as there never had been any fecal fistula. In explanation, he offers the following remarks.

It is a natural question, to ask what became of the gangrened portion of intestine? I am of opinion that it was discharged by stool, and this I conceive to have happened in the following way. An *intus-susception* or *invagination* of the intestine contained in the hernial sac, occurred either before or after the gangrene. The *invaginated* portion alone being attacked by gangrene, was carried along with the feculent matter into the large in-

testine, and from thence was discharged by stool. From the usual structure of these sort of *invaginations*, it may easily be conceived, how, after the separation of the mortified parts, the two extremities of the divided intestine would be necessarily in contact, and in the most favourable state for the formation of a cicatrix. However, they did not open into each other in a perfectly exact manner, as an extravasation of feculent matters took place, which was circumscribed by the adhesions of the intestine and omentum to the hernial sac, and of which the small culde-sac was evidently the remains.

There could remain no doubt with regard to the explanation which I have proposed, if the portion of intestinal canal, which I suppose to have been *intus-suscepted*, and afterwards separated by the gangrene, had been found in the feculent matter. It was not observed, either because it was not sought for, or because it was discharged in a state of decomposition, which did not allow it to be discovered. I shall supply this proof, the only one wanting, by relating a second case of the same kind, where it occurred along with all the others, in a strangulated and mortified umbilical hernia, in which a considerable portion of intestine having been insulated by gangrene, was discharged by stool. I shall relate it in the words of the author, M. Mullot, surgeon at Rouen, that there may be no suspicion of the fact having been exaggerated or changed in any way, by passing through several hands.

"On the 26th Floreal last (16th May) an 8, I was "sent for," says M. Mullot, "to a woman fifty-six years "of age, who had been subject, for a number of years, "to an umbilical hernia, which had been repeatedly at- "tended with unpleasant symptoms, and returned on the

" slightest causes; for during six years that I had at-
" tended the patient, I had reduced the hernia more
" than a hundred times, and it could never be kept re-
" duced by any bandage. I found the tumor larger
" than usual; the patient was likewise affected with con-
" siderable and very frequent vomiting of feculent mat-
" ter. I tried to reduce the hernia as usual, but I could
" not succeed completely. I ordered an emollient poul-
" tice to be applied to the tumor, and an embrocation to
" be used from time to time, in order to endeavour to re-
" lax the strangulation, and to effect the reduction, which
" I readily accomplished a few hours afterwards. I did
" not bleed the patient, because there were several coun-
" ter-indications. The symptoms continued in spite of
" the return of the parts, and I supposed from that cir-
" cumstance, that there was an internal strangulation.
" The patient discharged feces both by the mouth and
" by stool, the following day.

" On the three following days the vomiting continued,
" but the matter vomited was merely glairy. On the
" fifth day, the patient appearing more calm, was at-
" tacked with almost constant hiccup, sickness, and fre-
" quent syncope, which made me apprehend a mortifica-
" tion. I then had little hope of the patient's recovery,
" who remained in this state until the eighth day. At
" this period, two gangrenous escars formed about two
" finger's breadth below the umbilicus, and a third upon
" the cicatrix of the navel, which confirmed me in he
" opinion which I had already formed, that there was
" a mortification internally. There was no stoppage of
" the alvine discharge; the patient went to stool daily.
" I employed every possible remedy against the gan-
" grene, and I had the pleasure of seeing at the end of a

" few days, the escars circumscribed and separating, and " the wounds disposed to heal. On the 7th *Prairial*, " (27th May,) the patient had a copious stool, in which " the nurse told me she had passed *a sort of bladder*. On " asking to see this body, I was extremely surprised to " find a portion of intestine *about fifteen or sixteen inches* " *long*: it was accompanied through its whole length, by " a portion of mesentery almost unchanged. This extra- " ordinary event made me suppose, that there would be " an extravasation of feculent matter into the abdomen: " I was however mistaken; none took place. M. M. " Benard and Roussel, physicians of Rouen, saw the pa- " tient with me, and examined what she had passed.

" The patient continued improving until the 25th " Prairial, when she was attacked by a convulsive " cough, accompanied with vomiting of glairy matter, " which continued three days. An improvement again " appeared, and continued about three weeks. Her ap- " petite returned; solid food, taken in moderate quan- " tity, passed readily; but liquids were almost always re- " jected by vomiting. During this period, the patient " got out of bed, and felt very well. She went out twice " to breathe the fresh air. But on the sixtieth day of her " disease, she had a return of the convulsive cough, with " vomiting of mucus, which continued for three days. " Having again become more calm, she was affected with " frequent yawning, hiccup and syncope, and at last died " the sixty-fifth day of her disease, and the forty-fourth " after passing the portion of intestine by stool."

" On dissection we found the two extremities of the " intestine completely re-united; they appeared to be cut " like the mouth of a flagelet, and accurately adjusted " to one another in that direction. The point of re-union

" had contracted strong adhesions with the peritoneum, " on the left side of the umbilicus, near the ring; ne- " vertheless, the cavity of the intestine was not sensibly " contracted even at the place of the cicatrix. There " was not the slightest trace of extravasation. The " portion separated belonged to the jejunum and ileum. " The intestines were gangrenous at different points, at " a considerable distance from the re-united portion. The " liver was diseased. I do not believe," the author adds, " that this phenomenon was the work of nature alone; " I conceive, that at the time of using the *taxis*, I had " *invaginated* the intestine, which had probably, in con- " sequence of the inflammation occasioned by the origi- " nal strangulation, contracted adhesions above the por- " tion forming the bag; that in endeavouring to reduce, " I had made the one portion pass into the other, and " that from thence arose a new strangulation of the re- " duced portion, the division of it, and its discharge by " the anus."

Such is the rare and interesting case related by M. Mullot. The inferences drawn by him are very similar to those which I have deduced from the preceding. With regard to the influence of the *taxis* in producing the *intus-susception* of the intestine, I cannot decide how far that conjecture is well founded. However, I am inclined to believe, that the *intus-susception* of a part of the intestinal canal contained in a hernia, takes place in the same manner, and from the same causes as those which occur in the cavity of the abdomen. This leads me to offer some remarks on the latter.

M. Cayol then proceeds to quote a number of cases of *volvulus* without hernia, where portions of intestine of various lengths were thrown off by stool. In the first

case of Edward Cooke, fourteen inches of intestine were passed, and the patient survived many years. In a case quoted from the first volume of the medico-chirurgical transactions of London (*a*), about three feet of the colon were discharged three weeks before the patient's death; and in another, the patient survived two years after passing about six inches of the colon. There then follows an account of the case of M. Sobaux (*b*), where a portion of the colon twenty three inches in length was discharged, and the patient recovered. In another case by Hevin, the cæcum, with six inches of the colon, and as much of the ileum, were discharged; the patient lived thirteen days, and the fact is confirmed by the dissection of the body. M. Salgues (*c*) relates a case of *volvulus*, where in consequence of mortification the cæcum was passed by stool.

M. Cayol concludes his memoir, by mentioning cases of *intus-susception* in the different stages prior to the separation of the gut. In one, the intestine was inflamed and livid; and in another it was gangrenous; and in the last case of Mr. Thomas Blizard, (*d*) the intus-suscepted parts were in a state of complete strangulation and perfectly black.

(*a*) See also transactions of a society for the improve. of med. and chir. knowledge, vol. 2. p. 144.

(*b*) Mem. de l'acad. R. de chirurg. T. xi. p. 338.

(*c*) Ancien journal de médécine, T. 36. p. 515.

(*d*) Medico-chirurgical transactions of London, 1809.

EXPLANATION OF THE PLATES.

PLATE I.

a. a. The inguinal ring of the left side.
b. b. b. Intersection of the *collateral* tendinous bands of the aponeurosis of the *external* oblique, in the vicinity of the inguinal ring.
c. c. Left femoral arch.
d. *Suspensory* ligament of the penis.
e. The os pubis.
f. An inguinal hernia of the left side.
g. g. g. g. Divergence of the fibrous bundles of the cremaster muscle.
h. Continuation of the membrano-aponeurotic sheath of the cremaster muscle, which includes the spermatic cord and the vaginal coat of the testicle.
i. i. The right inguinal ring.
k. k. Intersection of the tendinous fibres of the aponeurosis of the *external* oblique muscle of the abdomen, in the vicinity of the right inguinal ring.
l. l. l. The sheath of the cremaster muscle laid open, on which, especially * at its outside, are seen the fibrous bundles of this muscle.

* On its sternal and ateral aspect.

m. Soft cellular substance interposed between the sheath of the cremaster muscle and the hernial sac.
n. The hernial sac formed by the peritoneum.
o. Small loop of ileum protruded.
p. p. The aponeurotic sheath of the rectus abdominis muscle laid open for a certain space, and drawn to each side.
q. q. Continuation of the aponeurosis of the *external* oblique muscle of the right side of the abdomen.
r. The right femoral arch.
s. s. The great sac of the peritoneum, through which are perceived the bowels.
t. Posterior * portion of the aponeurotic sheath, which incloses the rectus abdominis muscle.
u. u. The rectus muscle of the right side removed from its natural situation, and drawn strongly towards the left side of the abdomen.
v. Remains of the muscular portion of the *external* oblique which has been cut away.
x. The *linea alba* of the abdomen.
y. The anterior † portion of the aponeurotic sheath of the rectus muscle, formed by the union of the aponeuroses of the *external* and *internal* oblique muscles, divided and turned outwards ‡.
1. 1. The femoral artery on both sides.
2. 2. The femoral vein.
3. 3. The abdominal artery, or circumflex iliac.
4. Continuation of the right abdominal artery.
5. 5. The epigastric artery of each side.
6. 7. 8. 9. Course of the right epigastric artery, towards the rectus abdominis muscle of the same side.
10. 10. The origin of the epigastric vein of both sides.
11. 11. Continuation and distribution of the right epigastric vein.
12. 13. The *superior external* pudendal artery, which ran across over the hernia, immediately under the common integuments.
14. 14. The saphena vein.
15. 15. The *anterior* crural nerve.

* Central. † Peripheral. ‡ Peripherad.

16. 16. Two dotted lines, showing the direction which the viscera sometimes take in the formation of *internal* inguinal hernia, or on the *inner** side of the epigastric; in which case, this artery retains its natural situation. *See Mem. First*, § 26.

A. The external oblique muscle of the abdomen.

B. B. The rectus muscle of the left side of the abdomen.

C. The transverse muscle of the right side.

D. Portion of the *greater* glutæus muscle.

E. The tensor vaginæ femoris.

F. The rectus femoris.

G. The sartorius.

H. The iliacus internus.

I. Tendinous origin of the *second* adductor femoris.

* Mesial.

PLATE II.

a. a. The left inguinal ring.

b. b. Intersection of the *collateral* tendinous bands of the aponeurosis of the *external* oblique, in the vicinity of the inguinal ring.

c. c. c. c. c. The aponeurosis of the *external* oblique muscle of the abdomen, divided along the crest of the ilium and the *linea alba*, as far as the vicinity of the inguinal ring.

d. The left femoral arch.

e. e. The membrano-aponeurotic sheath of the cremaster muscle laid open.

f. Continuation of the sheath of the cremaster muscle, which contains the spermatic cord and the vaginal coat of the testicle.

g. g. g. The fibrous bundles of the cremaster muscle.

h. h. Soft cellular substance, interposed between the sheath of the cremaster and the proper hernial sac.

i. i. The hernial sac formed by the peritoneum.

k. k. A portion of omentum protruded and descended into the hernia.

l. l. The aponeurotic sheath of the rectus muscle of the left side, opened and turned back.

m. The great sac of the peritoneum, with the intestines shining through it.

n. The posterior* portion of the aponeurotic sheath, which inclosed the left rectus muscle of the abdomen.

* Central.

o. o. The left rectus muscle of the abdomen laid bare, and turned very much towards the right side of the abdomen.

p. The *internal* oblique muscle of the abdomen of the left side.

q. A portion of the great sac of the peritoneum, which, after dividing the aponeurosis of the fascia-lata, and raising the fallopian ligament, appeared externally * under the left femoral arch.

r. The common integuments of the scrotum.

1. The femoral artery.
2. The femoral vein.
3. The abdominal or circumflex iliac artery.
4. The origin of the epigastric artery.

5. 6. 7. 8. Continuation of the left epigastric artery, behind† the neck of the hernial sac, towards the rectus abdominis muscle of the same side.

9. The origin of the epigastric vein.

10. 11. 12. Continuation of the epigastric vein behind‡ the neck of the hernial sac, towards the rectus abdominis muscle.

13. The saphena vein.
14. The *anterior* crural nerve.
15. A curved dotted line, shewing the oblique course from the side to the pubes, which the viscera usually take in descending to form an inguinal hernia.

A. Glutæus maximus muscle.
B. The tensor vaginæ femoris.
C. The aponeurotic sheath of the thigh.
D. The sartorius muscle.
E. The rectus muscle of the thigh.
F. The vastus *externus.*
G. The iliacus *internus.*
H. The tendinous origin of the adductor muscles of the thigh.
I. The gracilis muscle.

* Peripherad. † Dorsad of. ‡ Dorsad of.

PLATE III.

a. a. a. The aponeurosis of the *external* oblique muscle of the abdomen of the left side, cut away along the *linea alba*, and * from within the inguinal ring, and then turned back on the pubes.

b. b. b. b. The aponeurotic sheath of the cremaster muscle, as seen from the posterior † part of the hernia, and laid open in its whole length; then drawn upwards from the bottom of the scrotum towards the side, and turned back upon the abdomen, along with the testicle of the same side.

c. c. c. c. Bundles of fibres of the cremaster muscle, which shine through the membrano-aponeurotic sheath of this muscle.

d. d. The vaginal coat of the testicle laid open.

e. The testicle.

f. The natural adhesion of the testicle with the vaginal coat, in which it is inclosed.

g. g. The epidydimis.

h. The posterior ‡ side of the hernial sac formed by the peritoneum, behind § which sac, or between it and the sheath of the cremaster muscle, likewise laid open and turned back, the spermatic vessels run, in their passage to be inserted into the testicle.

i. The bottom of the hernial sac.

k. The neck of the hernial sac.

* On the mesial side of. † Dorsal aspect. ‡ Dorsal. § Dorsad of.

l. l. Soft cellular substance, the continuation of that which accompanies the spermatic vessels, behind* the great sac of the peritoneum along the posterior† parietes of the hernial sac, and interposed between the sheath of the sac, and of the cremaster.

m. Smooth cellular substance covering the left side of the urinary bladder, without‡ the great sac of the peritoneum.

n. Prominence formed by the great sac of the peritoneum under§ the femoral arch, after dividing the aponeurosis of the fascia-lata, and raising the arch.

o. o. The great sac of the peritoneum, behind‖ which are seen the convolutions of intestines shining through.

p. The posterior** portion of the aponeurotic sheath, which incloses the rectus muscle of the abdomen of the left side.

q. q. The rectus muscle laid bare for a certain space, and turned very much over to the right side of the abdomen.

r. r. The *internal* oblique muscle of the abdomen of the left side.

s. The cellular substance of the scrotum.

t. The iliacus *internus* muscle.

1. The femoral artery.
2. The femoral vein.
3. The abdominal or circumflex iliac artery.
4. The origin of the epigastric artery.
5. A branch of the epigastric artery ramified over the margin of the pubes.

6. 7. 8 9. The continuation of the epigastric artery†† behind the neck of the hernial sac, to the left rectus muscle of the abdomen.

10. 11. 12. The spermatic artery.

13. 14. 15. The vas deferens.

16. 17. 18. The spermatic veins separated from the artery and from the vas *deferens.*

19. The divided extremity of the epigastric vein.
20. The saphena vein.
21. The *anterior* crural nerve.

* Peripherad of. † Dorsal. ‡ Peripherad of.

§ Centrad and sacrad of. ‖ Centrad of. ** Central. †† Dorsad of,

PLATE IV.

a. A PORTION of the great sac of the peritoneum laid bare, by means of the division of the inguinal ring; the incision is extended upwards * into the fleshy part of the abdominal muscles.

b. b. The hernial sac formed by the peritoneum.

c. c. Constriction formed by the neck of the hernial sac, situated a little more † inwards than the inguinal ring.

d. d. Some rugæ or bridles of cellular substance arising at different distances, around the stricture formed by the neck of the hernial sac.

e. e. e. f. f. f. The cellular substance external ‡ to the great sac of the peritoneum, which accompanies the hernial sac and the spermatic cord, and is interposed between the proper sac of the hernia and the aponeurotic sheath of the cremaster.

g. A small portion of the hernial sac removed, within which is seen a portion of a fold of the ileum.

h. i. k. l. The external § covering of the hernia, or the membrano-aponeurotic sheath of the cremaster.

m. The *greater* bundle of fleshy fibres of the cremaster.

n. o. p. Distribution of the bundles and serpentine fleshy fibres of the cremaster muscle.

q. q. The vaginal coat of the testicle laid open.

* Atlantad. † Centrad. ‡ Peripherad of. § Peripheral.

r. The tunica albuginea of the testicle.
s. Part of the epidydimis.
t. t. Varicose vessels of the spermatic cord, surrounded and included within the cellular substance. An incipient *Circocele.*
u. The integuments of the scrotum.
v. v. The muscular parietes of the abdomen laid open for a small space.
x. A denuded portion of the rectus muscle of the abdomen of the right side.
y. Continuation of the rectus muscle of the right side within its aponeurotic sheath.
z. Crest of the os ilium.

PLATE V.

FIGURE I.

a. a. A LOOP of ileum protruded at the left groin.
b. The omentum adhering to the * inner side of the neck of the hernial sac.
c. c. The edge of the omentum which did not adhere, turned back on the † outer side of the hernial sac.
d. The omentum surrounding the protruded intestine.
e. The omentum forming a sort of ring *b. d. e.* strangulated the loop of intestine, and is firmly attached to the ‡ posterior part of the hernial sac.
f. The place where the omentum produced the strangulation of the intestine in the greatest degree.
g. The bottom of the hernial sac.
h. The § external covering of the hernia formed by the membrano-aponeurotic sheath of the cremaster muscle.
i. i. The vaginal coat of the testicle laid open.
k. The testicle.
l. The epididymis.
m. n. The integuments of the groin and scrotum.
o. The right testicle inclosed in the scrotum.
p. q. q. The aponeurosis of the external oblique muscle of the abdomen.
r. r. The left inguinal ring.
s. The ventral aorta.
t. The inferior vena cava.

* Mesial. † Lateral aspect. ‡ Dorsal aspect. § Peripheral.

u. The lumbar vertebræ.
x. A portion of the left psoas muscle.
y. Part of the great sac of the peritoneum.

FIGURE II.

a. a. The aponeurosis of the external oblique muscle.
b. b. c. c. The hernial sac laid completely open.
d. d. Constriction of the sac a little below its middle.
e. The * *superior* cavity of the hernial sac.
f. The † *inferior* cavity of the hernial sac.
g. g. g. The deep fossa of the ‡ *superior* cavity of the hernial sac.
h. h. A dotted line, marking the bottom of the § *inferior* cavity of the hernial sac behind the testicle.
i. i. Membrano-aponeurotic expansion of the cremaster, lying over the tunica vaginalis testis.
l. l. The vaginal coat of the testicle laid open.
m. The testicle.
n. Part of the epididymis.
o. o. The integuments of the groin and scrotum

* Atlantal. † Sacral. ‡ Atlantal. § Sacral.

PLATE VI.

FIGURE I.

a. a. The aponeurosis of the *external* oblique of the right side.
b. c. The integuments of the groin and of the scrotum.
d. d. The hernial sac.
e. e. e. The omentum protruded in the hernia and adhering to the bottom and sides of the hernial sac.
f. A strip of omentum like a ribbon, adhering to the neck, to the sides and bottom of the hernial sac which compressed the loop of intestine at its middle so as to form two small loops, one on each side of the omental band.
g. g. The two small loops of intestine distended with air, and projecting on each side of the omental band, *f.*
h. i. Continuation of the sheath formed by the membrano-aponeurotic expansion of the cremaster.
k. The spermatic cord.
l. The testicle.
m. The epididymis.

FIGURE II.

a. A portion of the aponeurosis of the external oblique muscle of the abdomen constituting the superior* or † internal pillar of the left inguinal ring.

* Atlantal. † Mesial, as to insertion.

b. b. b. The hernial sac formed by the peritoneum.
c. c. The ileum in the cavity of the abdomen.
d. A loop of it protruded in the hernia.
e. Part of the omentum in the cavity of the abdomen.
f. f. Fissure formed in the omentum by the loop of intestine protruded in the hernia.
g. g. Adhesion of the omentum posteriorly * and to the sides of the hernial sac.
h. A complete ring formed around the loop of intestine by the omentum lacerated about its middle, and adhering posteriorly† and to the sides of the hernial sac.
i. i. Hard and callous edges of the preternatural fissure of the omentum.
k. The spermatic cord pushed towards the‡ outer side of the hernia
l. l. The vaginal coat of the testicle.
m. The epididymis.
n. The testicle.
o. o. The integuments of the groin and scrotum.
p. Part of the left rectus muscle.
q. Part of the great sac of the peritoneum.

* Dorsad. † Dorsad. ‡ Lateral aspect.

PLATE VII.

FIGURE I.

a. a. The cæcum.
b. b. b. The natural adhesion of the beginning of the colon and of the cæcum to the great sac of the peritoneum, as is observed in the natural state in the right ileo-lumbar region.
c. d. e. f. g. The hernial sac formed by that portion of the peritoneum which in the natural state occupied the right ileo-lumbar region.
h. The extremity of the ileum close to its insertion into the colon.
i. The beginning of the colon.
k. Fatty appendix of the colon.
l. The appendix *vermiformis.*
m. n. The membrano-aponeurotic sheath of the cremaster muscle laid open at the place where it surrounds the vaginal coat of the testicle.
o. o. The integuments of the scrotum.
p. q. Dotted lines pointing out the termination of the ileum and the beginning of the colon within the cavity of the abdomen.
r. The epigastric artery.
s. The epigastric vein.

FIGURE II.

a. a. A part of the cæcum protruded in the hernia.
b. c. The natural adhesion which connects the cæcum

and the beginning of the colon to the peritoneum *in situ* in the right ileo-lumbar region.

d. e. f. The appendix *vermiformis.*

g. h i. Natural adhesions of the appendix *vermiformis* with the part of the peritoneum which has protruded and forms the hernial sac.

k. The extremity of the ileum.

l. The insertion of the extremity of the ileum into the colon.

m. m. Dotted lines pointing out the position of the extremity of the ileum and of the beginning of the colon within the abdomen in the right ileo-lumbar region.

n. n. The aponeurosis of the external oblique muscle of the abdomen.

o. o. o. The hernial sac.

p. q. The vaginal coat of the testicle laid open.

r. The testicle.

s. The epididymis.

t. The spermatic cord.

PLATE VIII.

FIGURE I.

a. b. THAT portion of the left colon, which, previous to its descent into the scrotum, was naturally connected to the great sac of the peritoneum in the left ileo-lumbar region, in the vicinity of the great iliac vessels of the same side. This loop of the left colon is seen raised on purpose from the bottom of the hernial sac, and drawn outwards * in order to show clearly the natural union of this intestine with the portion of the peritoneum which has descended and forms the hernial sac.

c. c. c. The natural bridles or ligaments of the left colon connecting it to that portion of the great sac of the peritoneum protruded and forming the hernial sac.

d. The *lateral* ligament of the colon.

e. e. The hernial sac.

f. The neck of the hernial sac.

g. The cellular substance interposed between the hernial sac and the membrano-aponeurotic sheath of the cremaster muscle.

h. h. h. The membrano-aponeurotic sheath of the cremaster muscle.

i. i. The sheath of this muscle divided at the place where it tightly surrounds the vaginal coat of the testicle.

k. k. The vaginal coat of the testicle.

l. The testicle.

* Peripheral.

m. m. The integuments of the scrotum.
n. A part of the rectus muscle of the abdomen.
o. o. The aponeurosis of the *external* oblique muscle in the vicinity of the left inguinal ring.

FIGURE II.

a. a. A loop of the ileum protruded into the hernia.
b. b. The hernial sac laid open.
c. c. A part of the hernial sac thickened and indurated.
d. d. A thin and transparent membrane uniting the intestine to the bottom of the hernial sac. On the intestine being drawn gently upwards*, this membrane assumed the form of numerous ligamentous bridles.
e. e. The intestine seen through the thin membrane which keeps it united to the hernial sac.
f. f. The membrano-aponeurotic sheath of the cremaster muscle, with the vaginal coat of the testicle laid open.
g. The testicle.
h. The epididymis.
i. The spermatic vessels surrounded by the cellular substance of the cord.

FIGURE III.

a. a. A *congenital* omental hernia.
b. The testicle.
c. The epididymis.
d. Part of the omentum, which has assumed a cylindrical form, protruded into the hernia.
e. e. e. Fatty appendices of the omentum.
f. f. Strong adhesions of the omentum to the bottom of the hernial sac, or in this case, the vaginal coat of the testicle.

* Atlantad.

PLATE IX.

a. a. a. The omentum in the cavity of the abdomen.
b. The * *anterior* portion of the omentum, or that which was spread over the intestines.
c. The † *posterior* portion of the omentum which insinuated itself posteriorly ‡ behind some turns of the intestinal canal.
d. A bridle or noose formed by the two above mentioned portions of the omentum *b. c.*
e. e. The place where the omentum which had protruded into the hernia was cut away.
f. The remains of the omentum contained in the hernia.
g. g. The loop of ileum strangulated by the bridle or noose formed by the two portions of the omentum *b. c. d. e. e.*
h. h. The bottom of the ileum which re-appeared without the abdomen after it had been reduced.
i. i. Constriction formed by the neck of the hernial sac.
l. l. Part of the great sac of the peritoneum.
m. m. The hernial sac.
n. o. p. q. A very considerable portion of the ileum included in the noose formed by the § *anterior* and *posterior* ‖ portions of the omentum, *b. c. d.*
r. s. Continuation of the intestinal canal under the noose formed by the omentum.
t. The beginning of the colon.
u. u. The appendix *vermiformis.*
v. Glutinous adhesion of the omentum to the ileum beyond the strangulation.
x. The testicle.

* Sternal. † Dorsal. ‡ Dorsad. § Sternal. ‖ Dorsal.

PLATE X.

a. a. The femoral arch.
b. Part of the aponeurosis of the fascia-lata, left adhering to the margin of the fallopian ligament.
c. c. c. Aponeurosis of the *external* oblique muscle.
d. The inguinal ring.
e. The spermatic cord.
f. f. Bundles of fleshy fibres of the cremaster muscle.
g. g. The hernial sac formed by the peritoneum.—A femoral hernia.
h. h. The * external cellular coat of the peritoneum, which together with the inguinal glands and the aponeurosis of the fascia-lata, covered the hernial sac.
i. The loop of ileum protruded.
k. The *external* oblique muscle.
l. l. An incision made through the fibres of the *internal* oblique, and of the aponeurosis of the transverse, in order to expose the course of the epigastric artery, resting on the great sac of the peritoneum, and running towards the rectus muscle.
m. m. Division of the aponeurotic sheath of the rectus.
n. The † external edge of the rectus muscle laid bare, and a little turned back.
o. o. The aponeurotic sheath of the rectus muscle.
p. The iliacus internus muscle.
q. Part of the *external* oblique muscle.
1. The femoral artery.

* Peripheral. † Lateral.

2. The femoral vein.
3. The saphena vein.
4. The epigastric artery.
5. 6. 7. Continuation of the epigastric artery.
8. The abdominal or circumflex iliac artery.
9. The spermatic artery.
10. A small branch of the spermatic artery. The spermatic vessels are represented in this plate, raised by a hook. It is however quite evident, that if these vessels had been left to themselves, they would descend, as in their natural situation, to the vicinity of the edge of the fallopian ligament.
11. 12. The continuation of the spermatic artery.
13. 14. The spermatic vein divided into several branches.
15. 16. The *vas deferens*.
17. The *anterior* crural nerve.
18. The place where the spermatic artery is at the greatest distance from the edge of the fallopian ligament.

PLATE XI.

FIGURE I.

a. a. a. PART of the great sac of the peritoneum.

b. b. b. b. The part of the great sac of the peritoneum, which formed the neck of the hernial sac, and which is converted into a membranous *funnel*, or passage of communication between the two apertures of the intestine divided by gangrene.

c. The * *superior* orifice of the divided intestine.

d. The † *inferior* orifice of the intestine.

e. e. The place where the hernial sac strangulated the intestine.

f. The promontory or projection formed by the approximation, in a parallel line, of the two portions of the intestine divided by the gangrene.

g. The intestinal canal uninterrupted on the side next to the attachment of the mesentery.

h. i. The furrow, along which the feculent matter descended, passing from the *superior* orifice of the intestine into the membranous *funnel*, from whence it was directed into the *inferior* aperture of the intestine.

k. l. Fistulous canal of the groin, formed partly by the remains of the neck of the hernial sac, partly by the aponeuroses of the abdominal muscles, and by the common integuments of the groin.

* The orifice leading to the stomach.

† The orifice leading to the rectum.

m. The * *superior* part of the ileum.
n. The † *inferior* part of the ileum.
o. The mesentery.
p. The aponeurosis of the abdominal muscles, turned back upon the femoral arch.
q. q. The crest of the os ilium.
r. r. The articular cavity for the head of the femur.
s. The fat.
t. t. Tuberosity of the ischium.

FIGURE II.

a. The *superior* portion of the ileum.
b. The *inferior* portion of the ileum.
c. Segment of the ileum included in the strangulation caused by the neck of the hernial sac.
d. Remains of the circumference of the intestinal canal where the mesentery is attached, which was not strangulated by the neck of the sac.
e. The mesentery.
f. f. Part of the great sac of the peritoneum.
g. g. The hernial sac stripped of the ‡ external covering formed by the aponeurosis of the cremaster, and degenerated into a pulpy substance of a brown colour.
h. h. The precise place where the ileum was strangulated by the neck of the hernial sac.
i. The spermatic cord stripped of the sheath of the cremaster.
k. k. The vaginal coat of the testicle, after the removal of the aponeurotic sheath of the cremaster, within which it is inclosed.
l. The testicle
m. The epididymis.
n. The spermatic vessels in the vicinity of their insertion into the testicle.

* The part leading to the stomach.
† The part leading to the rectum. ‡ Peripheral.

PLATE XII.

FIGURE I.

a. The ‡ *superior* portion of the ileum.
b. The † *inferior* portion of the ileum.
c. c. c. The ileum laid open, including that portion of it which had been strangulated by the neck of the hernial sac.
d. The promontory formed by the approximation of the two portions of the intestine, *a. b.* in a line parallel to each other.
e. Deep depression of the *superior* portion of the ileum above ‡ the promontory.
f. g. The furrow by which the feculent matter prepared to descend from the § superior orifice of the intestine into the membranous funnel, after the separation of the gangrened portion of the strangulated intestine.
h. The continuation of the internal membrane of the intestine.
i. i. The seat of the strangulation caused by the neck of the hernial sac.

* Portion leading to the stomach.
‡ Atlantad of.
† Portion leading to the rectum.
§ Orifice leading to the stomach.

k. k. The hernial sac, after the removal of the aponeurotic sheath of the cremaster, changed in texture, in consequence of the preceding inflammation.
l. The spermatic cord.
m. m. The vaginal coat stripped of the aponeurotic sheath of the cremaster.
n. The epididymis.
o. The testicle.

FIGURE II.

a. The extremity of the ileum.
b. The colon.
c. c. The cicatrix of the integuments of the groin.
d. The colon adhering to the cicatrix of the integuments of the groin.

PLATE XIII.

FIGURE I.

Congenital umbilical hernia.

a. a. THE common integuments around the umbilicus raised into a tumor.

b. b. b. The external covering of the hernia formed by the spungy membrane, which surrounds the umbilical vessels through the whole length of the cord.

c. c. The internal and proper covering of the hernia formed by the peritoneum, or the hernial sac.

d. Part of the liver of a cylindrical shape, protruded through the umbilical aperture into the hernia.

e. e. The umbilical vein covered by the spungy substance surrounding the umbilical cord.

f. The left umbilical artery, which being of a greater size than usual, supplied the want of the right umbilical artery.

h. The umbilical cord.

FIGURE II.

Adventitious umbilical hernia in a child.

a. a. a. a. A layer of cellular substance united to the thin aponeurotic web of the abdominal muscles, which covered the hernia immediately under the skin.

b. b. The hernial sac formed by the peritoneum.
c. c. The small intestines pushed into the hernia, through the aponeurotic ring of the umbilicus.
d. The *linea alba.*
e. e. The recti muscles of the abdomen.
f. f. The external oblique muscles.

FIGURE III.

The suspensory bandage of Hildanus, for large umbilical hernia.

PLATE XIV.

FIGURE I.

Congenital umbilical hernia in the embryo *.

a. The umbilical cord.
b. Congenital hernia.

FIGURE II.

Congenital umbilical hernia of considerable size.

a. a. The external covering of the umbilical hernia, formed by the spungy substance of the cord.
b. The thin hernial sac formed by the peritoneum, within which are seen the intestines shining through.
c. c. The umbilical vein.
d. e. The two umbilical arteries.
f. The umbilical cord.

FIGURE III.

Two herniæ in an adult; the one a proper umbilical hernia, the other a hernia of the linea alba *above the umbilicus.*

a. a. The cellular substance which covered the hernia, immediately under the skin.
b. The aponeurotic aperture of the umbilicus of a round form.

* See Albinus, anotat. acad. lib. 1. tab. v. fig. iii.

c. c. The hernial sac formed by the peritoneum.
d. e. f. Divisions of the hernia.
g. The hernia of the *linea alba.* A cellular layer lying over the hernial sac.
h. The hernial sac formed by the peritoneum.
i. Oval fissure in the *linea alba.*
k. k. The *linea alba.*
l. l. The recti muscles of the abdomen.

FIGURE IV.

Umbilical hernia, consisting of omentum and intestine in an adult.

a. a. a. The hernial sac formed by the peritoneum.
b. The common integuments, which previous to the formation of the umbilical hernia, composed the cicatrix of the umbilicus.
c. c. c. The omentum adhering to the hernial sac in several places.
d. A loop of small intestine, which was inclosed in and covered by the omentum.
e. e. The *linea alba.*
f. f. The recti muscles of the abdomen.
g. g. The *external* oblique muscles.

FINIS.

EDINBURGH:
Printed by James Clarke.
1814.

PLATE I.

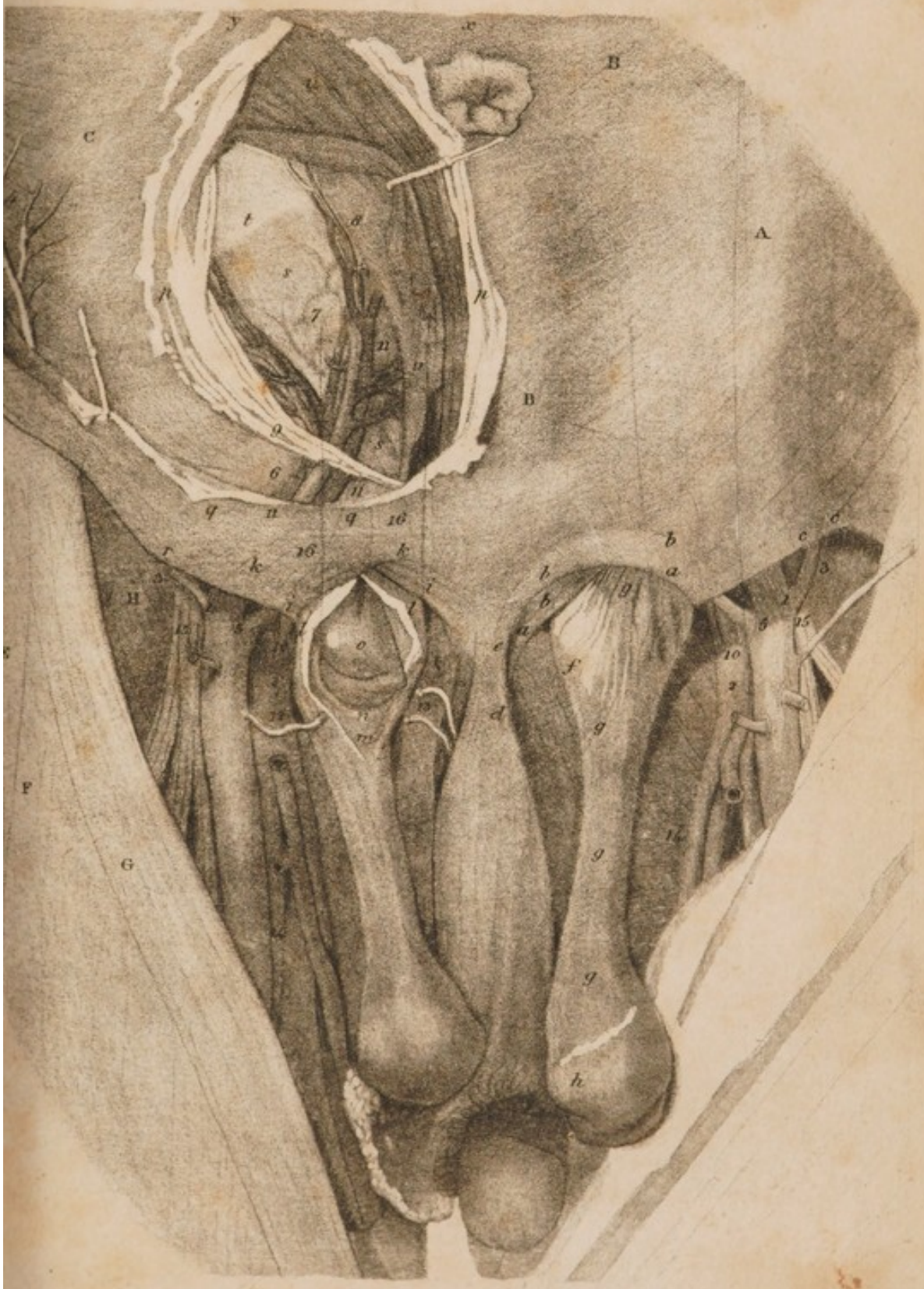
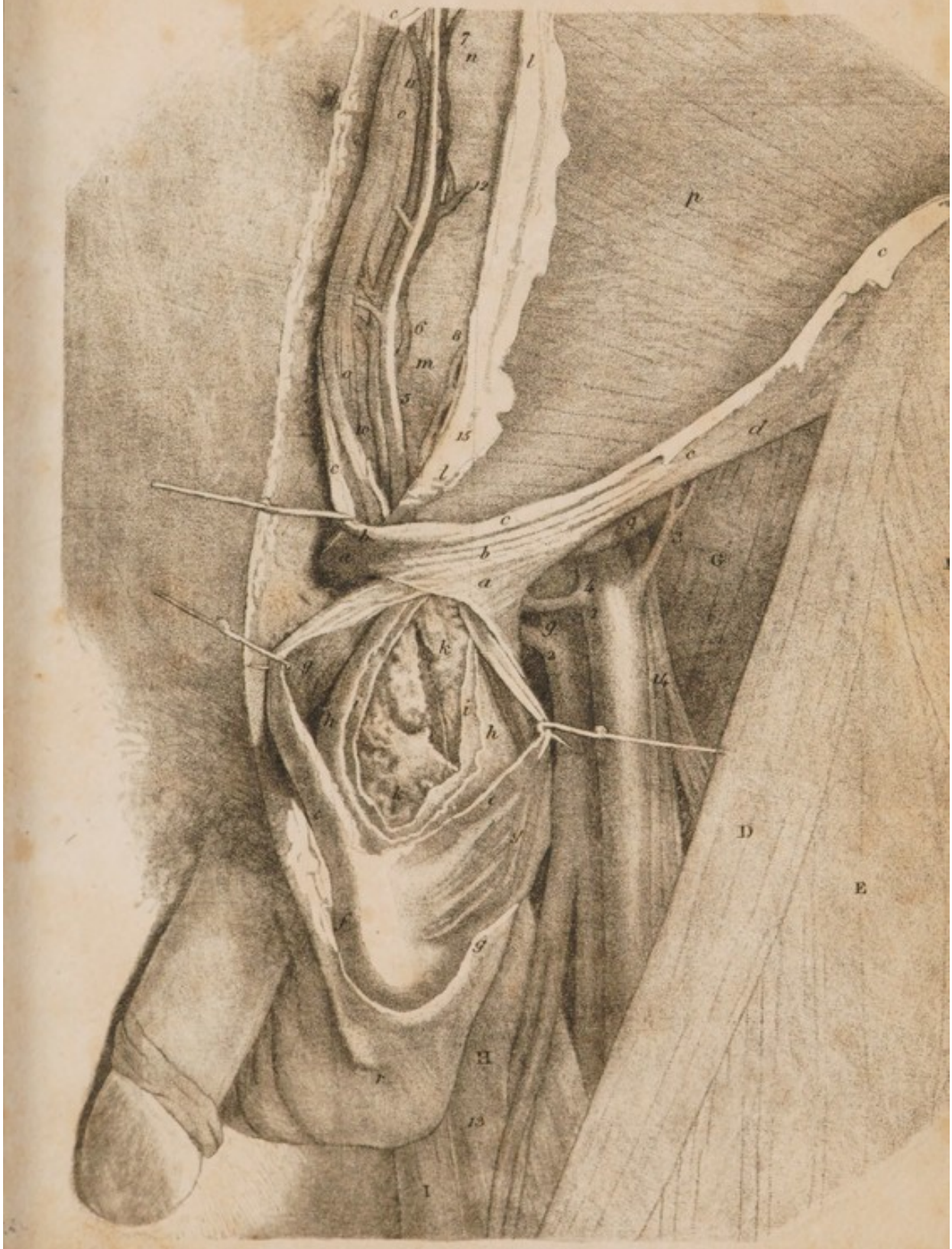


PLATE II.



E. Mitchell Sculp.

PLATE III.

E. Mitchell Sculp.

PLATE IV.

PLATE V.

Fig. 1.

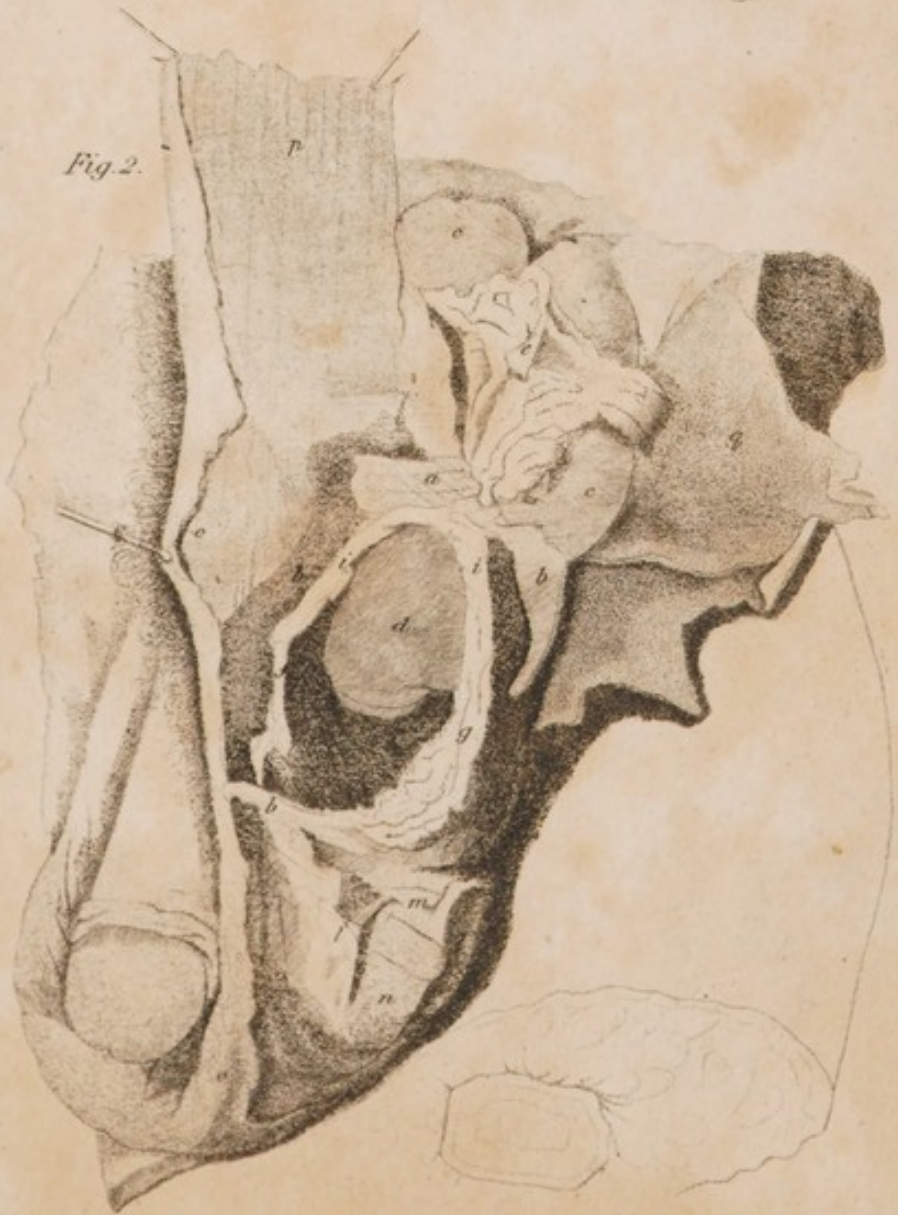
Fig. 2.

F. Mitchell, sculp!

PLATE VI.

Fig. 1.

Fig. 2.



E. Mitchell Sculpt.

Fig.1.

Fig.3.

Fig.2.

E. Mitchell, sculp.t

PLATE VII.

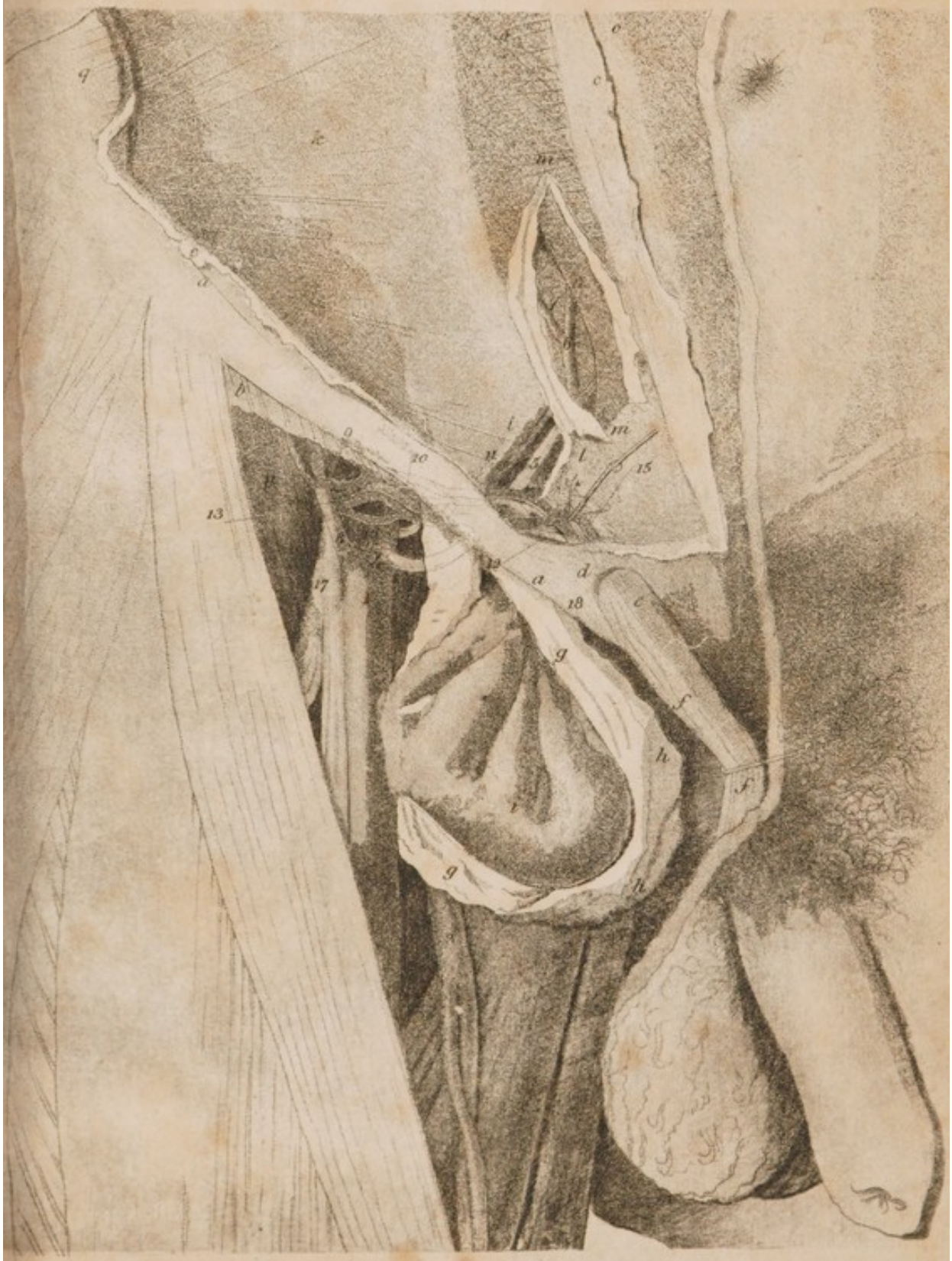
Fig. 1.

Fig. 2.

PLATE IX.

E. Mitchell sculpt.

PLATE X.



E. Mitchell Sculp.t

PLATE XI.

Fig. 1.

Fig. 2.

E. Mitchell Sculp.

PLATE XII.

Fig.1.

Fig.2.

F.Mitchell sculp.

Fig. 1.

Fig. 3.

Fig. 2.

PLATE XIV.

Fig. 1.

Fig. 2.

Fig. 3.

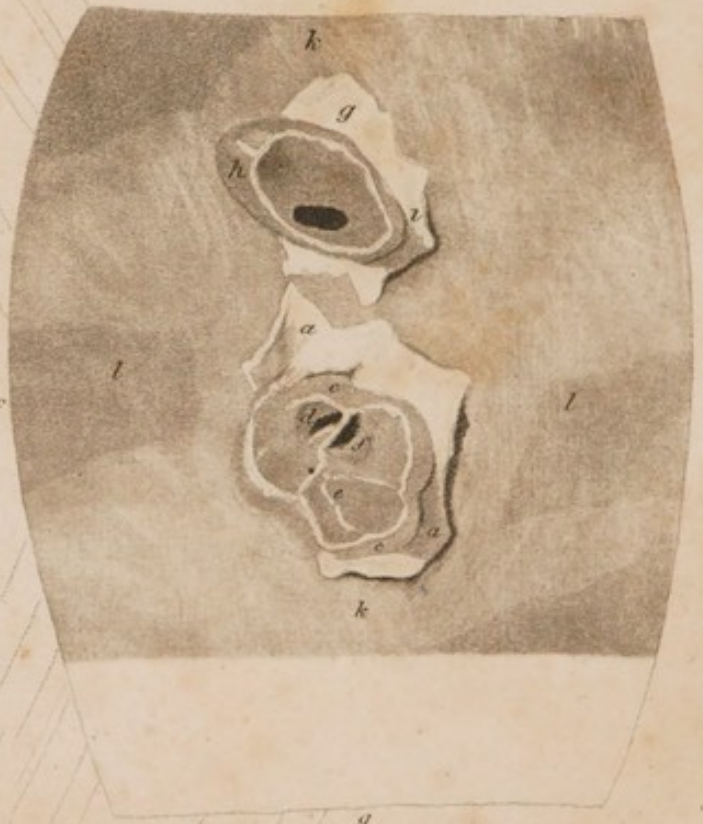


Fig. 4.

E. Mitchell, sculpt.