

number as twenty-five cases; that is, somewhat over 12 per cent. In the majority of these cases, it occurred in connection with pneumonia. It is almost always cortical, but may extend to the base and involve the nerves, leading in one case, which I saw with Dr. Ross at the Montreal Hospital, to strabismus, and also to ulceration of the cornea from involvement of the fifth nerve. In rare instances the spinal meninges are involved, and the clinical picture may be that of an acute cerebro-spinal meningitis (Hunolle, *Bull. de Soc. d'Anatomie*, 1874; and Heineman, *Med. Record*, New York, 1881, vol. ii). Acute suppurative parotitis was noted in three cases.

LECTURES

ON THE ANATOMY OF THE INTESTINAL CANAL AND PERITONEUM IN MAN.

Delivered at the Royal College of Surgeons of England.

By FREDERICK TREVES, F.R.C.S.,

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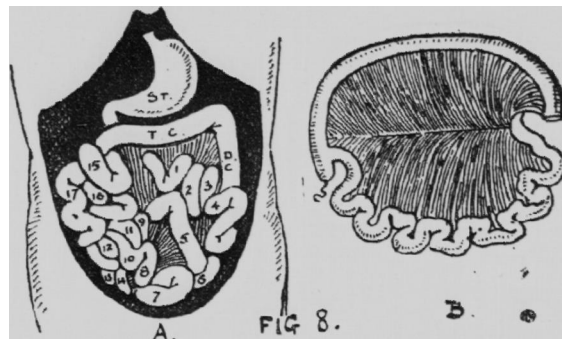
LECTURE II.

The Mesentery.—The mesentery, so far as its intestinal attachment is concerned, extends, it is needless to say, from the end of the duodenum to the ileo-cæcal junction. Its upper or right layer is continuous with the under layer of the transverse meso-colon, and with the peritoneum that invests the ascending colon. Its lower or left layer joins with the serous membrane that encloses the descending colon, that forms the sigmoid mesentery, and that descends over the lumbosacral eminence into the pelvis. The parietal attachment of the mesentery is liable to considerable variation, and cannot be so readily disposed of. The point at which this attachment commences above is practically constant. It corresponds with the ending of the duodenum, is about on a level with the lower border of the pancreas, and is just to the left of the vertebral bodies. From this point the insertion of the mesentery follows an oblique line that runs downwards and to the right, crossing the great vessels, and then ending in a somewhat uncertain manner in some part of the iliac fossa. The precise manner of its ending will be dealt with subsequently. In an ordinary case, if the mesentery be divided close to the bowel, and all the small intestine be removed, the membrane will appear as a well marked fold, arising by a narrow line from the posterior parietes, and deviating not very considerably from the middle line. It is important to recognise that this attachment does not represent the real root of the mesentery, nor is it any part of the attachment of the median vertical fold of peritoneum, that went to the primary intestinal loop. The real root of the mesentery is in the interval between the transverse colon and the duodenum, where the trunk of the superior mesenteric artery enters.

The lower part of the primary vertical fold is represented by the serous attachments of the descending colon to the parietes. The long line of insertion of the mesentery in the adult is entirely a secondary or acquired attachment. I might recall the fact that there is a time in the history of the development of the intestine when the small intestine, the ascending colon, and the right half of the transverse colon, all form part of a single simple loop, enclosed in a single fold of peritoneum, which is attached to the vertebræ, and has its root in the comparative narrow interval between the transverse colon and the duodenum. At such a time, the parts of the colon named and the small intestine have a mesentery in common. When the rotation of the bowel takes place as already described, when the colon crosses over the duodenum so as to reach the right hypochondriac region, this common mesenteric fold is rotated to the extent of half a circle. Thus it is that what was once the left and under layer of the common mesentery becomes the right and upper layer of the mesentery of the adult, and *vice versa*.

In time the cæcum descends to reach its final resting-place in the right iliac fossa. As it progresses it outgrows its serous covering, and in time the ascending colon above it acquires a non-peritoneal surface. This part of the large intestine is no longer a part of a free loop, and

what is now the permanent mesentery may appear for a while to come off from the parietes, along the inner border of the now attached ascending colon. As a result of further development, the line of



origin of the mesentery is moved nearer to the middle line, until it comes to occupy the position that is familiar in the adult. As a matter of fact, the isolation of the permanent mesentery appears before the descent of the cæcum, and it may be seen as a separate fold attached to the spine in the fetus, when the cæcum still occupies the right hypochondrium (Fig. 8 B). While the cæcum is in this position, the line of the attachment of the mesentery, such as it is, appears to be almost transverse, and it may not attain its permanent oblique direction until the cæcum has reached its goal in the iliac fossa.

In a large number of the mammalia, the ascending colon never loses any part of its original complete serous investment. It never, therefore, becomes attached to the parietes, but remains as a part of the great loop of intestine, and still invested in a simple mesentery that is common to it and the whole of the jejuno-ileum. In such animals the right limb of the large bowel remains singularly free; the mesentery of the small intestine retains its primitive relations; it acquires no secondary attachment to the parietes, and its sole root and attachment is in the narrow gap between the transverse colon and the duodenum. This condition is occasionally met with in the human subject. The ascending colon is entirely free up to the hepatic flexure, and is invested by a mesentery, common to it and the small intestine. I have met with two examples of this in one hundred specimens. The condition is of interest pathologically, as favouring the development of a certain form of volvulus of the cæcum and small intestine.

Putting aside this condition, it may be said that the parietal attachment of the mesentery measures, as a rule, about 6 inches; its mode of ending at its inferior extremity is as follows. When an ascending meso-colon exists, the mesentery ends by joining it. The two membranes meet at an angle, often at a right angle, and then the right layer of the mesentery becomes continuous with the left layer of the ascending meso-colon, and the left layer of the mesentery with the right one of the colic fold. When no meso-colon exists, the peritoneum that covers the cæcum is reflected from the hinder surface of that part of the bowel on to the posterior parietes; at this reflection the mesentery ends. Its left layer is continuous, and often in a line, with this reflected membrane, and then passes on into the pelvis, while its right layer is continued on to the ascending colon. As the position of this reflection varies considerably, so the length of the parietal attachment of the mesentery must be varied in proportion, and the same applies to cases where an ascending meso-colon exists.

The length of the mesentery from the spine to the intestine varies in different parts of the canal; its average length may be taken as between 8 and 9 inches. It soon attains its full length, and within one foot of the end of the duodenum is already 6 inches in length.

The longest part of the mesentery is that which goes to the coils of intestine that lie between a point 6 feet from the duodenum, and a point 11 feet from the same part of the gut. Such coils will, therefore, include 5 feet of the intestine, and the mesentery here not infrequently reaches the length of 10 inches. This point is of interest in connection with the position of certain coils of intestine, and to the subject allusion will again be made.

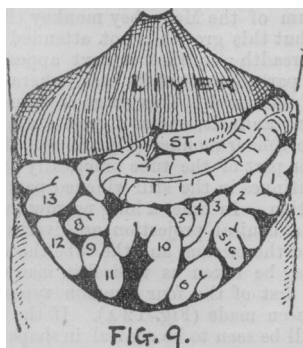
The important part that the mesentery must play in connection with the commoner forms of hernia has, it would appear, been somewhat overlooked. If the fresh body of an adult be opened, and the condition of the viscera and peritoneum be normal, it will be found that it is impossible to drag a loop of small intestine through the femoral canal (artificially enlarged) on to the thigh, or down the in-

guinal canal into the scrotum. In fact, no coil can, in any part, be drawn out of the abdomen below a horizontal line on a level with the spine of the pubes. It is evident, therefore, that, in a femoral or scrotal hernia, the mesentery must be elongated. Mr. Birkett, in his well known monograph on hernia, has drawn attention to this subject, but its importance in connection with the anatomical bases of heredity in some forms of rupture, and with the prospects of operation for radical cure, appears to have been overlooked.

It is not infrequent to find in women, at or past middle life, so loose and long a mesentery as to allow the bowels to be drawn from the abdomen some way below the line named. The same applies, in a less degree, to old subjects of both sexes; but such a condition is quite rare in well developed men in the prime of life. In one old woman, aged 70, the coils of the small intestine could be drawn so far out of the abdomen that they reached, in the middle line, to the level of a point no less than 8 inches below the anterior superior iliac spine. She had no hernia. The intestines were normal, but the ascending and descending meso-colons were the most extensive that I had met with. The presence of these latter folds had much to do with the remarkable mobility of the small intestine.

Before leaving the mesentery, it is necessary to allude to certain holes that are sometimes found in that membrane, and that have been, on many occasions, the cause of a fatal strangulation of the intestine. Strangulation of a loop of bowel through a slit or hole in the mesentery, is a recognised form of internal hernia. As to the precise nature of these abnormal apertures, I am not aware that any explanation has been given of their mode of origin. That a certain number are due to violence, and have resulted from injuries applied to the abdomen, there can be no doubt. Such apertures are usually slit-like and irregular, and of uncertain situation. In the majority of the examples of mesenteric hole, however, this theory of causation cannot apply; there is either an absence of any history of violence, or a history of inadequate violence. When I came to examine all the museum specimens to which I had access, and the accounts furnished in recorded cases of strangulation through a mesenteric hole, I found that the great majority of these abnormal gaps in the membrane presented the following common characters. The holes were round; they were situated in the mesentery of the terminal part of the ileum; their margins were distinct, being often thickened and opaque, and around a part of the margin it was not uncommon to find one of the terminal branches of the superior mesenteric artery. A systematic examination of the lower part of the mesentery, in a large series of cases, brought to light the following facts. In the fetus, it will often be observed that the ileo-colic branch of the superior mesenteric artery circumscribes, by its anastomosis with the last of the intestinal arteries, an area on the mesentery, of a well rounded or oval shape (a Fig. 13 G). This area is remarkable, in so far that it presents no fat, no visible blood-vessels of any kind, even in well injected specimens, and is never occupied by any mesenteric glands. An area so differentiated from the surrounding mesentery I have seen in fetuses of 6 and 7 inches in length; but although a common, it is not a constant condition. In many bodies beyond the period of foetal life, I have met with this singular and isolated area in the mesentery still retaining the characters just described, and rendered conspicuous by its thinness and bloodlessness.

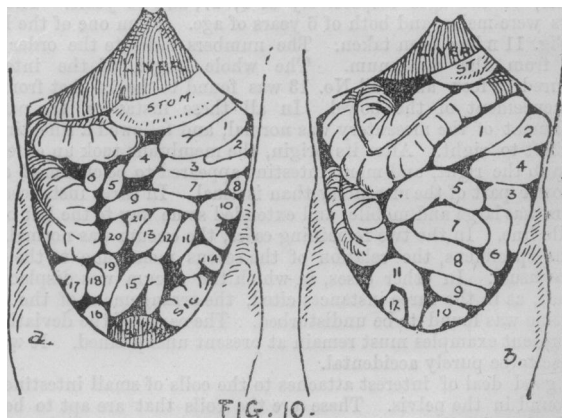
In the fetus at full term, and in children under puberty, it is usually about the size of a shilling-piece. The margins of the district are



marked by the arteries named, and are occasionally rendered more pronounced by some opacity of the membrane. It will be seen that this area has the precise situation, the outline, and the dimensions of the mysterious mesenteric hole; and by the atrophy of the peritoneum

occupying the district such a hole would be formed. I was fortunate enough to meet with a specimen that I venture to think will complete the argument that the common mesenteric hole is produced by atrophy of this particular patch in the peritoneum. In the body of a man aged 52, I found the area in the mesentery that I have just described very pronounced. It formed a patch of oval outline measuring $1\frac{1}{2}$ inches by $1\frac{1}{4}$ inches. It was entirely devoid of visible vessels, of glands, and of fat; while the adjacent mesentery was quite opaque from adipose tissue. The margin of the space was markedly opaque, thickened, and abrupt, and was skirted on the side nearest the cæcum by one of the terminal branches of the superior mesenteric artery. The serous membrane that formed this area was remarkably thin, clear, and atrophied. The atrophy was of such a degree that the little patch of peritoneum was cribriform, being pierced by about twenty holes. It is evident that but a slight degree of force would have been required to have forced a knuckle of bowel through this wasted membrane, and so have produced a strangulation of the bowel through a "mesenteric hole." In one specimen—in a male fetus at full term—where this peculiar oasis in the mesentery was well defined, the last intestinal artery had produced a fold at the cæcal margin of the patch (b Fig. 13 G). By this means a pocket was formed, which would have been a ready snare for a wandering loop of bowel, and would have directed such a loop through the thinned serous membrane.

The Arrangement of the Small Intestine.—In the one hundred specimens examined, I took great pains to ascertain if the small intestine followed a constant course, and if there were anything like a method in the arrangement of the individual coils. In each instance, when I had opened the abdomen, and before any of the parts had been disturbed, I affixed a brass number to every visible coil of small intestine. A drawing was then made of the parts as they lay *in situ*, and the position of each of the numbers subsequently ascertained by noting its distance from the commencement of the small intestine. The work was very laborious, and the results very scanty. I had some faint hope that an extensive examination of this character would enable the surgeon to form some notion of the part of the small intestine that would be likely to be involved in the various herniæ on different sides of the body. The investigation, however, showed that such a localisation is quite impossible. Apart from this, the intestinal coils conform in some degree to a definite arrangement in a



large number of cases. If the body of a fetus about 5 or 6 inches in length be examined, the cæcum will be found in the right hypochondrium; and, with little or no displacement of parts, the small intestine will be seen to be arranged along a curved line that is convex downwards, that is almost transverse, and that extends from the left side to a corresponding point on the right side (Fig. 8 A). This arrangement can still be followed out, although in a less definite manner, in a fetus at full term (Fig. 9). In both these diagrams, the numbers on the coils represent the order from the duodenum to the cæcum. In children, moreover, up to two or three years of age, the same general arrangement can often be followed out. In the majority of adult bodies, the small intestine is disposed in an irregularly curved manner from left to right. The gut, starting from the duodenum, will first occupy the contiguous parts of the left side of the epigastric and umbilical regions; the coils then fill some part of the left hypochondriac and lumbar regions; they now commonly descend into the pelvis, reappear in the left iliac quarter, and then occupy in order the hypogastric, lower umbilical, right lumbar, and right iliac regions.

Before reaching the latter situation, they commonly descend again into the pelvis. In the specimen from which Fig. 10 B was taken, this order was very fairly observed. The body was that of an adult male, aged 25. As a rule, however, the position of the individual coils is much less regular, and the arrangement depicted in Fig. 10 A (also from an adult body) shows very plainly the extent of the irregularity. The following facts will demonstrate the gross deviations that may be found from what may be regarded as the typical disposition of the intestinal coils. In the left lumbar region, loops may be met with that are respectively a few inches on the one hand and 15 feet on the other from the duodenum. In the left iliac quarter, the extremes are 2 feet and 23 feet; in the hypogastric, 11 feet and 26 feet; and in the right iliac, 9 feet and 28 feet. In one case, I found that a coil situated in contact with the middle of Poupart's ligament on the left side was only 11 inches from the end of the duodenum; and in another, a loop that was lying against the bladder in the middle line was only 2 feet from the same point. All these observations refer to the adult body.

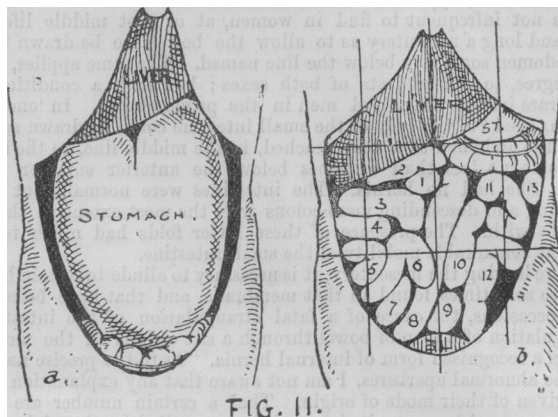
It is to be noted that in the fœtus, and during the earliest part of extrauterine life, the bulk of the small intestine is placed to the left of the middle line. This is on account of the relatively large size of the liver, to the weight of which the lesser bowel no doubt acts as a counterpoise. Such disposition of the intestine is not to be clearly observed in the adult; but I am under the impression that, if a vertical antero-posterior section of a frozen body were made, it would be found that the heavier segment of the small intestine lay to the left of the median line.

In five instances among the hundred specimens examined, the coils of the small intestine were arranged in a manner exactly the reverse to that usually found. In each example, the end of the duodenum was to the left of the middle line as usual, and the other abdominal viscera were normal as regards their general arrangement. Starting from the fixed point to the left of the spine, the intestine at once passed to the right, occupied the lower margin of the right hypochondrium, and then, in order, the right lumbar and iliac regions. The gut now descended into the pelvis, and then was found forming coils about the middle of the abdomen, and in the left iliac and left lumbar regions. In the latter district the lower end of the ileum was discovered, and it was observed to sweep across the abdomen from left to right, behind the other coils, to end in the cæcum. Three of the subjects were females, of the ages respectively of 3, 17, and 36 years. The two others were males, and both of 6 years of age. From one of the latter the Fig. 11 B has been taken. The numbers indicate the order pursued from the duodenum. The whole length of the intestine measured 15 feet, and coil No. 13 was found to be 14 feet from the commencement of the bowel. In all these instances, the parietal attachment of the mesentery was normal, and followed a line directed from left to right. After its origin, the membrane took an extensive sweep to the right, and more intestine appeared to be clustered about the lower part of the mesentery than is usual. In three instances, the cæcum was large and mobile, and extended some way to the left of the middle line. In the two remaining cases, the cæcum was normal. In all the specimens, the relation of the serous membrane to the colon was as usual. In other cases, in which the cæcum was displaced to the left, as in the three instances cited, the arrangement of the small intestine was found to be undisturbed. The cause of the deviation in the present examples must remain at present unexplained. It was too precise to be purely accidental.

A good deal of interest attaches to the coils of small intestine that are found in the pelvis. These are the coils that are apt to become involved and adherent in cases of pelvic peritonitis, and that would probably form the protrusion in most instances of obturator, sciatic, and pudendal hernia. In the fœtus, owing to the small size of the pelvic cavity and the great development of the sigmoid flexure, no coils of small bowel are found below the true pelvic brim. Soon after birth, however, the pelvis begins to accommodate intestinal coils, and in the body of a child, aged 4 months, I found 3 feet of the lower ileum occupying the pelvis. The amount of the intestine found in the adult pelvis depends mainly upon the state of distension of the bladder and rectum, and upon the position of the sigmoid flexure. When the latter loop or the cæcum is distended and occupies the pelvis, all small intestine may be excluded.

The coils that are most usually found in this position belong to the terminal part of the ileum, and to that part of the intestine that has the longest mesentery, the part, namely, that extends between two points, respectively 6 and 11 feet from the end of the duodenum. It is not, therefore, uncommon to find loops lying together in contact with the pelvic floor that are in reality some 12 or 14 feet apart, as may be seen when their proper position in the course of the bowel is defined.

I think this matter is deserving of attention, because it is not uncommonly assumed that the coils occupying the pelvis belong exclusively to the lower ileum, and anatomical text-books would not lead one to believe that jejunum is ever found in the pelvic cavity. The amount of small intestine that may be found in the pelvis, even in bodies that have been opened within a short while of death, is often considerable, and frequently measures 8 or 10 feet.



In the case of a woman, aged 82, the whole of the small intestine was found in the pelvis, with the exception of the first three feet of the jejunum, and the last two feet of the ileum. The specimen, however, from which Fig. 11 A, was taken, illustrates, in the most remarkable manner, the possible capacity of the pelvis. The subject was a woman, aged 59, who had died with cancer of the pylorus. When the abdomen was opened, nothing was seen but the stomach and a small part of the transverse colon, the latter projecting just above the symphysis. The whole of the small intestine beyond the duodenum was found entirely within the true pelvis, with the sole exception of the first 20 inches of the jejunum. This part of the tube descended quite vertically along the spine from the duodeno-jejunal junction to the pelvis. The small intestine, which had been emptied by starvation, measured 23 feet.

In more than one instance where there has been deformity or great distension of the transverse colon, I have found the whole of the small intestine, with the exception of the duodenum and the commencement of the jejunum, below a line drawn on a level with the summit of the iliac crest.

The Cæcum.—In shape and outline, the cæcum is liable to considerable variations. These variations, however, can be readily classified, and I shall endeavour to show that all forms of the cæcum can be placed under one of four common types.

The particular outline of the human cæcum and the nature of the deviations that it may present, can be best demonstrated by a reference to the development and early condition of this part of the colon. The cæcum appears first as a simple conical projection from one side of the intestinal loop. The projection is short, and is broad at the base. It may be considered to be permanently represented in anatomy by the cæcum of the Mangabey monkey (Fig. 15 A). It soon grows in length, but this growth is not attended by a corresponding development in breadth; so that it next appears as a long tube of equal width in all parts, except at its base, where it widens out before it joins the rest of the bowel. This stage is permanently represented by the cæca of many animals, and as a good example may be selected the cæcum of the Spider-monkey (Fig. 14 D). As development advances, the greater part of the tube practically ceases to grow, while active increase continues in the still widened part of the bowel at the base of the projection. In time, a long narrow tube is found hanging from the apex of a conical projection or diverticulum of the bowel; the latter is named the cæcum, and the tube the vermiform appendix. This condition may be taken as typical in man of the foetal cæcum, and it forms the first of the four common types of cæcum to which allusion has just been made (Fig. 12 A). If the typical foetal cæcum be examined, it will be seen to be conical in shape; from its apex, the appendix arises, and this apex is about in a line with the long axis of the colon, and corresponds very nearly to the centre of that intestine. Now, from the colon, three longitudinal muscular bands descend to the cæcum. The exact position of these bands and their relation to the outline of the cæcum have been very ably detailed by Professor

Flower. The three bands meet at the apex of the cæcum, that is, at the root of the appendix; one band lies on the side of the bowel into which the ileum enters; a second is placed upon the postero-external aspect of the colon and cæcum; and whilst the third, and the most distinct, runs along the anterior aspect of the gut. The last named band about corresponds to the central vertical axis of the ascending colon. In the foetal cæcum, these three bands are placed at nearly equal distances from one another, and so divide the caput coli into three fairly equal parts. The first or foetal type of cæcum may persist throughout life. In one hundred bodies, I found two examples of such persistence. Both the subjects were females, of the ages respec-

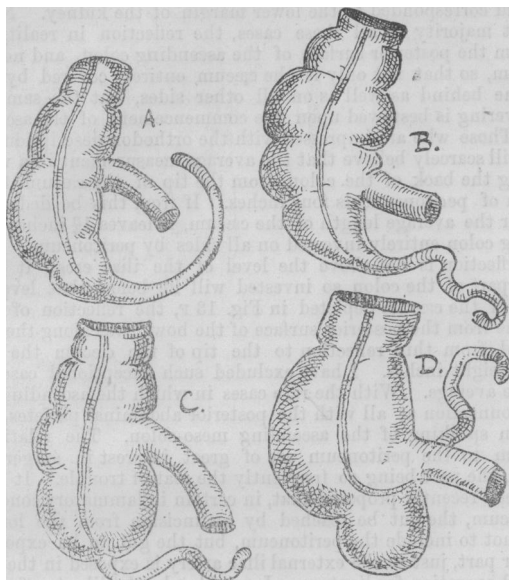


FIG. 12

tively of 50 and 70 years (Fig. 12 B). In the second type of cæcum (Fig. 12 c), the three bands retain their relative positions. If the part be viewed from in front, there is an equal extent of gut on each side of the anterior band; the apex of the cæcum retains its original position, and this type differs only from the last described by the loss of the conical outline and the substitution of a more quadrilateral shape. The apex appears between two bulging sacculi, instead of at the summit of a cone, and it will be seen that all parts of the caput have developed to an equal degree. This would appear to be the form of cæcum that is usually met with in the anthropoid apes. I found a good example of it in a Silvery Gibbon (Fig. 15 c). It is rare in the human subject, and I met with only three instances among the hundred specimens examined. In the cæcum of the third type, that part of the caput coli that lies to the right side of the anterior band grows quite out of proportion to the part placed to the left side of the band, as the parts appear when viewed *in situ*. Moreover, the anterior wall of the cæcum becomes more developed than the posterior wall. As a result, the true apex of the cæcum is turned more and more to the left, until at last it is placed in close proximity to the ileo-cæcal junction, and can be only recognised by noting the point of origin of the appendix. The highly developed part to the right of the anterior band becomes so dependent and prominent, that it forms a new or false apex to the cæcum, and it is, indeed, to this projection that the anatomical term "apex" is usually applied. Moreover, from the undue development of the anterior wall, the root of the appendix (the true apex) is carried towards the posterior aspect of the caput, and by these changes the cæcum of the third type is produced (Fig. 12 D). This form is the most usual one, and represents the condition of the cæcum in the great majority of all subjects beyond the period of foetal life. It appears to me that the transformation described depends to a great extent upon the arrangement of the blood-vessels. The cæcum is supplied by the ileo-colic artery. This vessel is directed towards the ileo-cæcal junction. Before it reaches the bowel, it divides into two branches: one passes to the anterior aspect of the gut, and runs down the cæcum in a curve, with the concavity towards the ileum, until it reaches the anterior band upon which it ends. Many branches come off from the convexity of this little trunk, but no visible arteries of any magnitude (and often none at all) come off from its

convex side. It results, therefore, that the main part of the blood carried by the trunk will reach that part of the cæcum that is to the right of the anterior band, while but a fractional part will go to the wall of the caput to the left of the band. It may not be unreasonable therefore, to associate this unequal blood-supply with the very unequal growth that is observed upon the two sides of the band. In animals with more equally developed cæca, it will be seen that the blood-supply is also equable, a fact well illustrated in the cæca of the Mangabey and Spider-monkey. The other branch of the ileo-colic trunk proceeds to the posterior aspect of the gut; but, although of larger size than its colleague, comparatively little of the blood that it carries can reach the cæcum, since it runs in the mesentery of the appendix. This may serve to explain the greater development of the anterior wall of the cæcum, when compared with the posterior part. In the cæcum of the fourth type, the development of the part of the bowel to the right of the anterior band is excessive, while the segment to the left of the band has atrophied, and is more or less wanting. (Fig. 13 E.) In this form, the anterior band runs to the inferior angle of junction of the ileum with the cæcum. The root of the appendix is posterior to that angle. There is no trace of the original apex, and the appendix appears to spring almost from the ileo-cæcal junction. I have met with five examples of this type. In four instances, the subject was an adult; while, in the fifth case, the specimen was obtained from a fetus at full term. In venturing to propose this classification of cæca under four types, I might mention that I have as yet met with no form of cæcum that could not be placed in one or other of these four divisions.

It is needless to say that, apart from its outline, the cæcum presents variations in its general development. In some instances, the part is small and insignificant; while, in other instances, it may attain remarkable proportions. As an example of the latter condition may be taken the cæcum represented in Fig. 13 F. It was from the body of a man, aged 65, whose abdominal viscera were all healthy. The cæcum, and the part of the ascending colon immediately above it, were free, and entirely enveloped in peritoneum to the extent of eight inches. The caput coli was found turned upside down, so that its apex pointed upwards, and the ileum entered it on the right side. This great cæcum projected some way to the left of the middle line, and its summit was not far below the liver. It was so mobile that its apex could be made to touch a point on the front of the thigh, six inches below the anterior

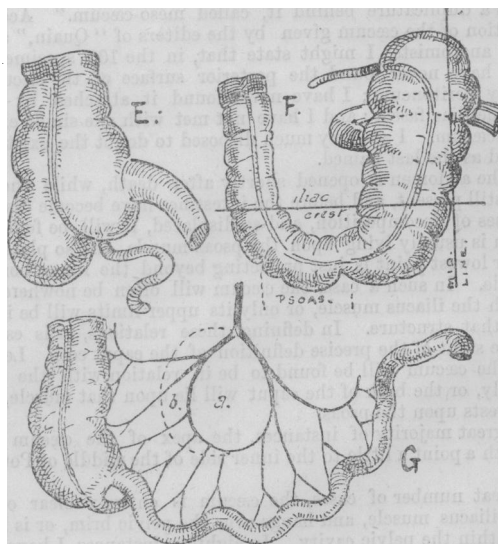


FIG. 13.

superior iliac spine. In the diagram, the parts are represented as they appeared *in situ*. In another peculiar specimen, from a man, aged 48, I found the cæcum rotated to the right around its vertical axis. The rotation was such that the ileum passed behind the cæcum to enter it on its right side. The anterior band also inclined to the right border, and, from the same aspect, the appendix arose. The cæcum was free, and entirely invested by peritoneum; it was held down by no fold; there were no traces of peritonitis; and the twist, which in no way affected the lumen of the bowel, could not be unfolded. I imagine

that the condition must have been due to an unequal development of the component parts of the gut. The colon was perfectly normal.

In another instance, the posterior part of the cæcum was much more developed than was the anterior part; with the result that the ileum entered the large intestine from the front, and the appendix vermiformis came off from the anterior wall of the caput coli.

With regard to the dimensions of the cæcum, it is necessary, before they can be given, that the limits of this segment of the gut be clearly laid down. The cæcum is defined as that part of the colon which is situated below the entrance of the ileum. The breadth of this part, therefore, may be represented by a line drawn transversely across the bowel, at the level of the lower border of the ileum, at the ileo-cæcal junction. The length may then be expressed by a vertical line drawn from the line just named to the apex or lowest point of the cæcum. From careful measurements, made of a large number of adult cæca, I find that the average breadth of this part is three inches, and the average length two and a quarter inches. The largest cæcum that I met with had a diameter of four inches. The smallest (from the body of a well developed woman, aged 36) measured only three-quarters of an inch in length, and one and a half inches in breadth. It is exceptional to find a cæcum with both its diameters equal.

It will now be convenient to consider the relations and connections of the cæcum; and here I might at once state that the result of my investigations upon this point is entirely at variance with the statements contained in the anatomical text-books. The account given of the cæcum in works on anatomy would appear to be very ancient. It can be traced back, from book to book, through many literary generations; and, throughout its long history, it seems to have undergone little or no alteration. It is one of these descriptions that forms a real anatomical property, and that descends from one author to another with the precision of entail.

The following is the account of the caput coli that is given in the last edition of Quain's *Anatomy*, a book that very justly holds the proud position of being the best work on anatomy extant. "The intestinum cæcum, or caput cæcum coli, is that part of the large intestine which is situated below the entrance of the ileum..... The cæcum is situated in the right iliac fossa immediately behind the anterior wall of the abdomen. It is covered by the peritoneum in front, below, and at the sides; but behind it is usually destitute of peritoneal covering, and is attached by areolar tissue to the fascia covering the right iliacus muscle. In this case, the cæcum is comparatively fixed; but in other instances the peritoneum surrounds it almost entirely, and forms a duplicature behind it, called meso-cæcum." Accepting the definition of the cæcum given by the editors of "Quain," and by all other anatomists, I might state that, in the 100 specimens examined, I have never found the posterior surface of the cæcum uncovered by peritoneum; I have never found it attached by areolar tissue to the iliac fascia; and I have not met with one single example of a meso-cæcum. I am very much disposed to doubt the existence of such a fold as the last named.

When the abdomen is opened shortly after death, while the rigor mortis is still present, and before the intestines have become distended by the gases of decomposition, and so displaced, it will be found that the cæcum is usually lying upon the psoas muscle, and so placed that its apex or lowest point is just projecting beyond the inner border of that muscle. In such a case, the cæcum will often be nowhere in relation with the iliacus muscle, or only its upper limits will be in contact with that structure. In defining these relations, it is essential not to lose sight of the precise definition of the caput coli. Less frequently, the cæcum will be found to be in relation with the iliacus muscle only, or the bulk of the caput will lie upon that muscle, while the apex rests upon the psoas.

In the great majority of instances, the apex of the cæcum corresponds with a point a little to the inner side of the middle of Poupart's ligament.

In a great number of cases, the cæcum is entirely clear of both psoas and iliacus muscle, and hangs over the pelvic brim, or is lodged entirely within the pelvic cavity. In eighteen instances, I have found the cæcum in this latter situation lying sometimes directly upon the pelvic floor, or placed in contact with the upper surface of the bladder or uterus, or wedged in with the sigmoid flexure, or lying actually in contact with the left wall of the pelvic basin. It cannot be said to be exceedingly unusual to find that some part of the cæcum has just passed to the left of the median line of the body. Now in every instance that I have as yet seen, the cæcum has been entirely enveloped on all sides by peritoneum, and has been free in the abdominal cavity.

The line of reflection of the peritoneum from the posterior wall of the cæcum on to the posterior abdominal parietes varies somewhat.

When an ascending meso-colon exists, this reflection will coincide with the origin of such meso-colon. In any case, it is continuous with the left or under layer of the mesentery. The reflection is usually transverse, and is commonly placed between a line on a level with the summit of the iliac crest and another on a level with the anterior superior iliac spine. It is as a rule limited to the surface of the psoas muscle, or to that muscle and a small part of the adjoining part of the iliacus. In a few instances, the reflection has coincided with the latter muscle only. The line of the reflection may in a smaller series of cases be oblique. In such instances, it may follow the inner border of the psoas muscle, or cross the surface of that muscle, or correspond to its outer margin. In one specimen, the line of reflection was transverse, and corresponded to the lower margin of the kidney. Now, in the great majority of all these cases, the reflection in reality takes place from the posterior surface of the ascending colon, and not from the cæcum, so that not only is the cæcum entirely covered by serous membrane behind as well as on all other sides, but the same complete covering is bestowed upon the commencement of the ascending colon. Those who are impressed with the orthodox description of the cæcum will scarcely believe that the average measurement in a vertical line along the back of the colon, from the tip of the cæcum to this reflection of peritoneum, is four inches. If from this be deducted 2½ inches for the average length of the cæcum, it leaves 1½ inches of the ascending colon entirely invested on all sides by peritoneum. As the line of reflection is not above the level of the iliac crest, it follows that the part of the colon so invested will lie below that level. In the case of the cæcum depicted in Fig. 13 F, the reflection of serous membrane from the posterior surface of the bowel was along the pelvic brim, and from this reflection to the tip of the cæcum the bowel measured eight inches. I have excluded such exceptional cases from the above average. With the rare cases in which the ascending colon has no connection at all with the posterior abdominal parietes, I will deal when speaking of the ascending meso-colon. The relations of the cæcum to the peritoneum are of great interest in surgery and medicine, the part being so frequently the seat of trouble. It has, I notice, been recently proposed that, in certain inflammatory conditions of the cæcum, the gut be reached by an incision from the loin, the incision not to include the peritoneum, but the gut to be exposed at its hinder part, just as the external iliac artery is exposed in the extra-peritoneal operation for ligature. I would take the liberty of stating that such a procedure is anatomically impossible. With regard to the mysterious meso-cæcum, it is probable that that term has been applied to the lowest part of the ascending meso-colon, the limits of the cæcum having been ignored when the nomenclature was evolved.

The mobility of the cæcum is often considerable, and depends in the main upon two conditions—either upon the length of intestine that extends between the tip of the cæcum and the reflection of the peritoneum above alluded to, or upon the presence of an ascending meso-colon. The former factor is of greater moment than the latter. In eleven bodies, I have met with cæca that could be made to touch the under surface of the liver, and any part of the left side of the pelvis. In some of these specimens, the cæcum might very well have occupied an inguinal or femoral hernia on the left side, had the hernial orifice been large enough. In one case the tip of the cæcum could be made to touch the xiphoid cartilage, and in several instances the mobile piece of intestine could be drawn down the thigh to the level of the great trochanter.

BIOLOGY AND PHYSICAL CULTURE.—The University of Pennsylvania has opened two new departments: a School of Biology, which will be under the direction of Professor Joseph Leidy and Dr. Horace F. Jayne; and a Department of Physical Culture under the charge of Dr. J. William White, who is President of the University Athletic Association, and who has the authority and title of Professor, and a seat in the Faculty. This department will be modelled after that of Harvard University. The school of biology has a separate structure situated on the grounds of the University. The new building is of brick, and is two stories in height; the upper floor is devoted to laboratories, library, and private rooms; the first floor has the lecture-room, museum, and working-rooms, while in the basement are a large aquarium and storage rooms. The object of this new school, which is modelled after the Johns Hopkins School, is the encouragement of individual and original biological research. A zoological table at the Naples Station, has been established. It is intended that the work of the new school will be published in monographs or journal form.

THE Dover Guardians have increased the salary of Mr. Edwin Fenn, the medical officer to the workhouse, from £100 to £130 per annum.