A Demonstration

ON

DIVERTICULA OF THE ALIMENTARY TRACT

OF CONGENITAL OR OF OBSCURE

ORIGIN.

GIVEN AT THE ROYAL COLLEGE OF SURGEONS, ENGLAND,
BY
PROFESSOR ARTHUR KEITH, M.D., F.R.C.S. ENG.,
CONSERVATOR OF THE MUSEUM.

ABNORMAL diverticula of many different kinds are found in connexion with the alimentary tract. The annexed table will show you to what extent the various forms are represented in the college museum (Column A) and also in the museums attached to the various medical schools in London (Column B).

List of Specimens Illustrating Diverticula of the Alimentary Tract in the Medical Museums of London.

	A.	B.	Total.
I. Retro-cricoid diverticula of the pharynx ...	3	7	10
II. Traction diverticula of the oesophagus ...	2	10	12
III. Cysts apparently derived from the oesophagus...	1	5	6
IV. Diverticula of the stomach ...	1	1	2
V. Pressure diverticula of the duodenum ...	5	7	12
VI. Developmental diverticula of the duodenum and neighbouring parts of the alimentary tract	2	0	2
VII. Cysts connected with the intestine ...	2	1	3
VIII. Pressure diverticula connected with the small intestine	5	2	7
IX. Pressure diverticula connected with the great intestine	2	5	7
X. Meckel's diverticulum ...	11	84	95
	34	122	156

Retro-cricoid Diverticula of the Pharynx.

In Fig. 1 I have represented a typical retro-cricoid diverticulum of the pharynx, drawn from one of the three preparations in the museum of the Royal College of Surgeons. There are seven preparations in the museums of the metropolitan medical schools, so that I have had an opportunity of studying ten in all, six of which show the sac in its relationship to the pharynx. In all six, as in the specimen shown in Fig. 1, the pouch springs from the posterior wall of the pharynx, its orifice being situated opposite the cricoid cartilage. The sac is composed of the mucous and submucous coats of the pharynx, which have become gradually evaginated between two definite parts of the inferior constrictor muscle. On the smaller sacs, and round the necks of the larger, may be seen scattered muscle fibres derived from the inferior constrictor. The two parts of the inferior

constrictor separated by the opening orifice of the diverticulum are shown in Figs. 1 and 2. The lowest part is mainly attached to the cricoid cartilage, and serves as a sphincter to the upper orifice of the oesophagus.* The upper or chief part of the inferior constrictor serves quite another purpose; its main function is to seize the bolus of food and force it into the oesophagus in the following manner. In deglutition the larynx is drawn upwards and forwards, the quadrate plate of the cricoid cartilage being thus drawn away from the posterior wall of the pharynx, so that the bolus of food which is to be forced into the oesophagus may sink into the space between the quadrate plate of the cricoid and the inferior constrictor. The moment the bolus of food has reached the retro-cricoid space it is seized by the inferior constrictor, compressed against the cricoid quadrate plate, and forced past the sphincter into the oesophagus. Apparently in the act of swallowing the upper sphincter of the oesophagus is relaxed, but of the nervous mechanism concerned we know nothing. A study of the mechanism of swallowing shows why diverticula arise at the junction of the two parts of the inferior constrictor between the upper part, which acts as a force-pump, and the lower part, which is sphincteric in nature. It is between these two parts that the mucous membrane of the pharynx becomes evaginated to form diverticula.

It is certain that these pouches are unconnected with embryological branchial clefts;† they have never been seen in fetuses, nor in children; the youngest subject I have found a record of was 45 years of age. Although these pouches cannot be regarded as embryonic remnants, yet it is very probable that the opinion expressed by our leading authority on these structures—now President of this college—that they are the result of a congenital predisposition, is true, but at the present time one cannot decide whether the predisposition is a defect in the arrangement of the inferior constrictor or to a functional disturbance in the action of its two parts. Preparations of the pharynx made by the prosector, William Pearson, show that the diverticula arise where a special deep layer of the inferior constrictor ends; these deep longitudinal fibres have been described by the late Professor Birmingham.¹ Mr. Bilton Pollard,² in a remarkable case published recently, found that the pouch became 2½ in. deeper in five years. Mr. Bowlby informs me that they are more apt to occur in people with long necks. Another case is well described by Mr. William Taylor.³ In 1905 Mr. Butlin⁴ published an account of a series of 8 cases.

Fig. 1.—Specimen showing the relationship of the retro-cricoid diverticulum to the inferior constrictor. (No. 2291.)
Fig. 2.—Showing the sphincteric part of the inferior constrictor (A).
A, Sphincteric part of inferior constrictor; B, D, propelling part of inferior constrictor; C, E, vertical, deep fibres derived from the middle constrictor, stylo-pharyngeus and palato-pharyngeus.

Diverticula of the Oesophagus.

In the museum of the Royal College of Surgeons there are two typical specimens of "traction" diverticula of the oesophagus, one of which is represented in Fig. 3. These diverticula are commonly found on the anterior wall of the oesophagus, near the bifurcation of the trachea. They vary in size; the smaller may hold a pea, the larger will take the point of the little finger. Adherent to the fundus of the sacculæ are found (1) a lymphatic gland, usually showing marks of former inflammation, and (2) a fibro-muscular cord (Ribbert's cord), which ends on the posterior aspect of the trachea or of the bronchi. The diverticulum

is composed chiefly of the mucous and submucous coats of the oesophagus, but the attenuated muscular coat may also be present. Ribbold⁵ has recently devoted a monograph to these pockets; they rarely give rise to clinical

* After these demonstrations were delivered Dr. Scanes Spicer was good enough to draw my attention to a very remarkable paper by Professor Gustav Killian of Freiburg in the *Annales des maladies de l'oreille et du larynx*, 1908, t. xxxiv, p. 8. In this article Professor Killian gives a full description of the upper sphincter of the oesophagus, of its anatomy, physiology, pathology, and relationship to pharyngeal diverticula, anticipating me in every point, and proving his thesis in a more complete manner than I have done.

† Professor Fawcett of Bristol has informed me that he has seen a diverticulum in the developing pharynx of a pig which corresponds in position to the diverticula found in the human pharynx.

symptoms. Their origin is due to (1) a localized adhesion of the oesophagus to the surrounding parts, usually due to inflammation of one of the bronchial glands; (2) to traction of this adhesion, which occurs during coughing, deep inspiration, and deglutition. In these acts the trachea and oesophagus move independently and elongate the adhesions formed between them, with the result that "traction" diverticula of the oesophagus are formed.

Fig. 3.—Traction diverticulum of the oesophagus (Preparation No. 2291A).

Besides these traction diverticula there are others of a more obscure nature. One of these, in the college museum, No. 2291c, occurs in the lower third of the oesophagus of a horse. The muscular coats, especially the longitudinal, are greatly hypertrophied (Fig. 4). The diverticulum is wide-mouthed and shallow, and appears to have been formed by the evagination of the mucous membrane in a rent of the longitudinal coat. In another specimen in the museum of Guy's Hospital the pouch measures 30 by 40 mm.

Cysts Apparently Connected with the Oesophagus.

In this group I include a series of six preparations all of which are of an obscure nature.

Fig. 4.—Diverticulum in the oesophagus of a horse (Preparation No. 2291c).

In Fig. 5 is shown a preparation in the college museum (No. A 2324) presented by Dr. R. G. Hebb⁶ some years ago. A cyst about 20 mm. in diameter occurs in the wall of the upper part of the oesophagus. It gave rise to no symptoms and lies against the left and posterior wall of the trachea. The cyst wall, which contains striated and non-striated muscle, is lined by an epithelium similar to that of the trachea. It evidently arose during the separation of the trachea from the oesophagus. Were this cyst to communicate with the oesophagus a form of pouch or diverticulum would be produced, very similar to one recently described by Dr. Denyer.⁷ Two preparations in the museum of Guy's Hospital show a small cyst in the wall of the oesophagus—probably derived from distended glands. Two other preparations in the museum attached to the schools of St. Thomas's and St. George's Hospitals show a cyst of a different nature—probably dermoid. These cysts, of large size—30 to 40 mm. in diameter—are situated immediately behind the oesophagus in the posterior mediastinum. A preparation in the museum of Charing Cross Hospital shows a large cyst at the junction of the oesophagus and stomach.

Diverticula Connected with the Stomach.

Diverticula connected with the stomach are very uncommon. In some mammals, such as those of the pig family, diverticula are developed normally in connexion with the cardiac end of the stomach; indeed, the cardiac end of the human stomach is developed as a diverticulum of the foregut. I have seen only two preparations of diverticula of the stomach. In both cases these diverticula were connected with the cardiac end, and were evidently pathological in nature. One of these is in the college museum, and was obtained from the body of a woman over 70 years of age. The diverticulum is wide-mouthed and shallow, with an attenuated covering of muscular fibres. It arises from the cardiac end of the stomach, just below and behind the entrance of the oesophagus. In the other preparation, in the museum of Guy's Hospital, the diverticulum is composed merely of mucous membrane, and arises from the stomach near the oesophageal orifice. Recently Dr. Falconer⁸ has described a case in which a diverticulum was connected with the pyloric part of the stomach. Pancreatic tissue was developed at the fundus of the diverticulum.

Fig. 5.—Cyst in the upper part of the oesophagus (Preparation No. A 2324).

Pressure Diverticula of the Duodenum.

In old people, especially in those who are the subjects of visceroptosis, it is not uncommon to find diverticula in the posterior wall of the duodenum near the termination of the common bile duct. These diverticula are pouches of mucous membrane, varying in size from 10 to 25 mm. in depth, extruded at certain weak points in the musculature of the duodenum—weaknesses due to the oblique manner in which the terminal part of the common bile duct perforates the muscular coat of the duodenum. These pouches appear to give rise to no functional disturbance. I had an opportunity of studying twelve preparations illustrating these traction diverticula, five of which are in the college collection. In three specimens there were two pouches, the orifices being situated to the right and left of the terminal part of the common bile duct (see Fig. 6). In seven specimens only the right pocket was present; in one

Fig. 6.—Three specimens of duodenal diverticula. The common bile duct is seen passing down the posterior aspect of the duodenum. A, represents an incipient stage of the pouch; B, a small pocket to the right of the common bile duct; C, a pocket on each side.

only the left. In another case the orifice of the pocket was situated 20 mm. above the termination of the common bile duct. The exact manner in which these pouches are produced is obscure, but since they are composed purely of mucous membrane, and arise at definite weak points in

the musculature, one may safely infer that they are of the nature of pressure pouches. They are so frequent in the subjects of visceroptosis that one must suppose they are produced either by a compression of the terminal part of the duodenum which passes under the origin of the superior mesenteric artery, or that they are produced by traction at the terminal part of the common bile duct where prolapse of the duodenum takes place. Pilcher has attributed the earliest case on record to Morgagni; the paper by Rolleston and Fenton⁹ in 1900 was the means of directing the attention of medical men in this country to their occurrence.

A specimen in the museum of St. George's Hospital shows the ampulla of Vater converted into a large cyst.

Developmental Diverticula of the Duodenum of Neighbouring Parts of the Gut.

The pockets just described are certainly produced by obscure forces acting in later life, but the forms now to be described are produced during embryonic life. In mammalian embryos during the second month of development, Drs. F. T. Lewis and F. W. Thyng¹⁰ found numerous epithelial outgrowths along the whole length of the intestinal tract, but especially in the duodeno jejunal part. These outgrowths, which gradually disappear, were similar in nature to the buds which give rise to the pancreas. Diverticula of the intestine, with masses of pancreatic tissue at the fundus, have been described by Mr. H. S. Clogg¹¹ and Professor Alexis Thomson¹²; mention has already been made of Dr. Falconer's case, in which a pancreatic diverticulum was connected with the pyloric part of the stomach. Preparations illustrating this form of diverticulum are rare in metropolitan medical museums. In a preparation of congenital occlusion of the duodenum, presented to the college museum by Mr. Ernest Shaw, there is a shallow diverticulum from its first stage, but the glandular tissue at its fundus has rather the structure of Brunner's glands than of the pancreas. Another specimen in the college museum (No. A 2523) shows an accessory pancreas attached to the upper part of the jejunum, but there is no diverticulum. A pouch, arising from the third stage of the duodenum, recently described by Professor C. M. Jackson,¹³ may have arisen from a congenital pancreatic diverticulum.

Cysts Connected with the Intestine.

Of the various museum preparations I had an opportunity of examining, only three showed a cyst connected with the intestine. The most typical specimen is No. 2523 G of the college collection, presented by Mr. Frederic Eve. A serous oval cyst, some 25 mm. in its greatest diameter, lies between the layers of the mesentery where these are reflected on the jejunum. It is not improbable that a cyst such as this is formed from one of the many intestinal diverticula which Lewis and Thyng have observed during development, for they noted that their communication with the intestine may become closed and a cyst thus formed. A cyst in a similar position, but much larger in size (45 by 25 mm.) is shown in a specimen in the museum of St. Bartholomew's Hospital (No. 1952 A), but in this case the cyst possesses two communications with the jejunum. No. 264 A in the college museum illustrates a dermoid cyst connected with the small intestine of an ox.

Pressure Diverticula of the Small Intestine.

The preparation I have selected to illustrate this condition is one recently presented to the college museum by the authorities of the medical school of Middlesex Hospital through Dr. Ernest Lakin. It is a segment of the jejunum (Fig. 7) measuring 16 in. in length with its

mesentery still attached. Along the line of the mesenteric attachment is a series of pockets or diverticula of the mucous membrane, lying between the layers of the mesentery and varying in size from a pea to that of a hen's egg. On each of the smaller cysts a vessel ends, countenancing the theory that these diverticula perforate the muscular coat at the points where the vessels enter and leave the submucous coat. Such specimens demonstrate the strength and value of the peritoneal coat of the bowel; such diverticula are always formed along the mesenteric line, where the muscular coats are unsupported by a serous covering. The exact manner in which they are formed is obscure; one cannot conceive either the segmental or the true peristaltic movement of the intestine as sufficient to produce them; to give rise to such diverticula there must be a high intra-intestinal pressure such as occurs during irregular tonic contraction of considerable segments of the intestine. There are four other specimens besides the one shown in Fig. 7 in the college collection; one of these was obtained from Mr. Langstaff's museum; another, from a boy who died of septicaemia, was presented by Mr. Marcus Beck; a third, in which the diverticula are filled with cholesterin-lime bodies, came from Sir Erasmus Wilson; the fourth specimen was found in an ox. There is also a specimen in St. Bartholomew's Hospital Museum, and another—a single cyst in the upper part of the jejunum—in the museum of Middlesex Hospital. Thus, as far as I know, there are

Fig. 7.—Segment of the jejunum showing numerous pressure diverticula in various stages of development. The arrows indicate the diverticula.

only seven museum specimens in London of this condition, and all of them affect the jejunum or commencement of the ileum. Dr. Angus Johnson¹⁴ described a case in an old man of 90 in which there were numerous diverticula along both the large and small intestine. The same writer mentions the fact that Hansemann has demonstrated the artificial production of such diverticula by subjecting closed segments of intestine to high degrees of pressure. Dr. Scot Skirving¹⁵ has described invaginated diverticula of the small intestine, but I have seen

no illustration of this condition.

Multiple Diverticula of the Great Intestine.

Although multiple diverticula of the great intestine—especially of the iliac and pelvic segments of the colon—are not infrequently seen in the *post-mortem* room, there are comparatively few specimens in the metropolitan museums. In the college museum there are only two—one presented by Sir Erasmus Wilson in 1884, and another from a dissecting room subject added to the collection last year. In the museums attached to the medical schools I saw only five specimens. Last year Mr. W. H. Maxwell Telling¹⁶ was able to give an account of 80 cases, 33 of which manifested no clinical symptoms. His article is the best contribution that has been made to the literature of this obscure condition.

In Fig. 8 I give a section across one of the specimens in the college museum. The diverticula are of various sizes, and do not contain concretions. In another case which I examined, and in the specimen presented by Sir Erasmus Wilson, there were concretions composed of cholesterin and calcium carbonate. When concretions are present the orifices of the diverticula are very small. Most of the diverticula, but not all, occur either at the attachment of the mesocolon or in the roots of the appendices epiploicae. They are true evaginations of the mucous membrane through the muscular coat, evidently caused by a high intracolonic pressure. The taenia of the colon, in the segments where these diverticula occur, are so strongly contracted—a tonic contraction evidently—that the wall of the colon is thrown into circular folds, somewhat after

the manner of a concertina; but so deeply do these folds invade the lumen of the colon, and so closely do they come into apposition, that a forward passage for the contents of the intestine is nearly impossible. The circular coat is also irregularly contracted. The diverticula of mucous membrane are evidently extruded at weak points of the muscular coat of the colon, their evagination being caused by an irregular and continued contraction of the musculature of the colon, especially of the longitudinal bands. The vessels for the appendices epiploicae arise from the submucous plexus of the colon, and apparently the diverticula occur, as Klebs has pointed out, at the points at which the vessels perforate the muscular coat. Meckel's diverticulum and other structures connected with the yolk sac form the subject of a separate demonstration.

Meckel's Diverticulum.

It is a remarkable fact that man is almost the only mammal in which Meckel's diverticulum occurs with any degree of frequency. Dr. Chalmers Mitchell,¹⁷ on examining over 200 mammals of various species, did not find a single instance, and found no record in literature with the exception of one by Pallas, who had seen it in a species of rodent. Amongst certain families of birds Dr. Chalmers Mitchell found that Meckel's diverticulum was always represented, especially amongst wading and swimming birds. Johannes F. Meckel,¹⁸ however, in his textbook on pathological anatomy, published in 1812—where one may still find the best and fullest description of the structure which has received his name—mentions the fact that it occurs not infrequently in the pig. All the specimens—some 95 in number—in the medical museums of London are from man. There is a specimen in the college collection of the ileum of the ox with a shallow diverticulum which may be Meckelian in nature, but, with this exception, the human form is the only one represented in our museums. It is just possible that the frequent persistence of a part of the yolk sac in man—a part which

a real placenta. He illustrates the manner in which the yolk sac is drawn completely within the body of birds towards the end of the incubation period. He must have been familiar with the fact that in mammals the yolk sac is not retained as in other vertebrates, but cast off with the membranes. His brother William, in his great work on the gravid uterus, gives an excellent drawing of a third-month human embryo in which the sac is seen at the distal or placental end of the umbilical cord, for that structure is developed from the belly wall of the embryo round the neck of the yolk sac. As the umbilical cord

elongates, the neck of the yolk sac is drawn out to the full length of the cord, and undergoes a complete atrophy in the process. If the intra-abdominal part of the neck of the yolk sac persists it forms a Meckel's diverticulum. There are specimens in the physiological series showing Hunter knew that remnants of the artery and vein of the yolk sac may persist within the abdominal cavity of young mammals—structures with which Meckel was also familiar.

A study of the museum preparations perhaps over-emphasizes the dangers of possessing a Meckel's diverticulum. Of the 95 preparations, 37 had caused acute obstruction; 3 had produced intussusception, 3 had been the seat of inflammation (diverticulitis); the remainder—52 in number—were discovered in the routine work of the dissecting or post-mortem room.

Dr. H. T. Gray¹⁹ was able to collect, from medical records published between 1893 and 1907, 150 cases in which Meckel's diverticulum was the cause of intestinal obstruction.

I have notes relating to the length of the diverticulum in 51 preparations. In 11 it was under 25 mm.; in 21 it was over 25 but under 75 mm.; in 14 it varied between 75 mm. and 100 mm.; in 5 it was over 100 mm., the longest specimen (130 mm.) being one described recently by Mr. F. G. Parsons, and presented to the collection of this college by the authorities of the medical school of

Fig. 8.—Part of the colon showing the relationship of the diverticula to the taenia, and the manner in which the lumen is occluded by semilunar folds.

Fig. 9.—Illustrating various remnants of the mesentery of Meckel's diverticulum and of the vessels of the yolk sac. A. Showing the termination of the arterial cord (a) and the venous cord (b) in the mesentery of a kitten. The cords are attached to the umbilicus (umb.). B. The persistence of the arterial cord in a human subject. C. Showing the free border of the mesentery of Meckel's diverticulum separated to form a cord (a). D. Specimen showing a Meckel's diverticulum with a well-developed mesentery. The arrow perforates the part of the mesentery which may atrophy, thus leaving the free border as a cord.

may be described as its neck—is owing to the comparatively rich and abundant nourishment that is available for the mother amongst civilized races.

Not one of the eleven specimens of Meckel's diverticulum in the college museum belongs to the original Hunterian collection, although in the physiological series of the museum there is the most complete evidence that Hunter had studied the history of the yolk sac in all forms of vertebrates. Numerous preparations of his show the function and fate of the yolk sac in fishes—how it gradually shrivels up and disappears within the body as the young fish matures, and how in certain sharks it forms

St. Thomas's Hospital. As regards form, 30 may be described as sausage-shaped, 12 as saccular, 9 as conical, 23 as vermiform, 13 as filiform, 3 as hemispherical, and 3 as vestigial—mere serous tags on the free border of the ileum at Meckel's site. In 12 preparations there were secondary sacculations of the diverticulum, situated at or near its fundus.

The diverticulum may be provided with a mesentery similar to that of the appendix, which usually passes, not behind the ileum as is the case with the mesentery of the appendix, but in front of it, although this is not invariably the case. In birds the diverticulum has both an anterior

and a posterior mesentery. In 16 specimens of the 95, the mesentery was well developed; in 3 it was vestigial. In 6 of the specimens with a well developed mesentery a single artery passed to the diverticulum near the free border of the mesentery. In 10 preparations there was no mesentery, only a cord of varying length passing from the mesentery of the ileum, to end in the fundus of the diverticulum (Fig. 9, C). There can be no doubt now as to what that cord is; it is a persistent free border of the original mesentery of the diverticulum—usually containing a remnant of the vessels to the diverticulum, the rest of the mesentery having undergone the normal process of atrophy (Fig. 9, D). This interpretation was forced on me some years ago by the study of intermediate forms, but I found from Dr. Ernst Schwalbe's excellent textbook²⁰ that Neumann had given the correct explanation years before me. A diverticulum provided with such a cord forms a snare in which a loop of bowel is apt to become strangulated; indeed, most cases of strangulation occur with this form. In three cases the apex of the diverticulum was adherent to the mesentery of the ileum—an adhesion which may be the result of inflammation or of merely a contraction of the mesenteric cord. In three cases the diverticulum was turned up and almost adherent to the front of the mesentery of the ileum owing to a peculiar shortening or contraction of the mesentery of the diverticulum.

The ileum often shows a marked constriction or narrowing in the neighbourhood of a Meckel's diverticulum. In 12 of the preparations the constriction was just above the diverticulum, in 8 below it, and in 7 almost opposite to it. These constrictions are of two kinds: (1) those due to the pressure or traction exercised by the mesentery of the diverticulum as it crosses the ileum; (2) those due to an irregular growth or expansion of the Meckelian loop of the ileum—the last part of the intestine to be differentiated from the yolk sac.

In twelve preparations, all of them derived from subjects under 12 years of age, Meckel's diverticulum ended at or near the umbilicus. In nine of the twelve there had been an umbilical fistula at birth, which had become closed spontaneously or by operative measures; in the remaining three specimens the diverticulum terminated imperiously as a cord which was attached to the umbilicus or to the abdominal wall some distance below. The most remarkable specimen of this group is No. 548 B in the college collection (Mr. Bilton Pollard's case), where the diverticulum is 90 cm. long, and arises from the jejunum 60 cm. below the pylorus. In this case there was also an umbilical hernia.

Many cases have been reported recently where masses of glandular tissue, similar to the pancreas in structure and in function, have been found embedded in the wall of a Meckel's diverticulum, even in those which open at the umbilicus. I met with no example of an accessory pancreas attached to a Meckel's diverticulum, but it is possible that a microscopic examination may reveal pancreatic tissue in some of the museum preparations. Those which I have examined showed the same microscopic structure as the ileum, and it is not impossible that the diverticulum in many cases represents not a part of the yolk sac, but a part of the ileum which has been imperfectly separated from the yolk sac. As already mentioned, Drs. Lewis and Thyng found that an accessory pancreatic outgrowth may be formed in any part of the bowel. In explanation of the occurrence of an accessory pancreas in Meckel's diverticulum, one must remember that at an early stage of development—the end of the third week—the mouth of the yolk sac extends up to the second stage of the duodenum, where the pancreas has its origin.

Omphalo-mesenteric Cords formed by the Vessels of the Yolk Sac.

The intra-abdominal part of the vitelline duct (neck of the yolk sac) may undergo a normal atrophy, and yet the artery of the sac may persist, forming a stout cord between the umbilicus and mesentery of the ileum, over which the bowel may become strangulated. There is such a specimen in the college collection and three others in museums attached to medical schools in London (see Fig. 9, B). The cord is also present in two specimens of umbilical hernia in the college collection. In newly-born puppies and kittens these cord-like remnants of the yolk sac vessels are found

constantly, a fact which Hunter was familiar with, and their nature was fully understood by Meckel. In kittens and puppies the cord representing the vein ends at the lower border of the pancreas; that representing the artery ends in the mesentery of the ileum. I have seen no remnant of the vein in human subjects, but in two malformed human fetuses with umbilical hernia I found the superior mesenteric vein, which is derivative of the vein of the yolk sac, terminating in the placenta in place of in the portal vein. Dr. H. E. Jordan²¹ found that there may be two veins to the yolk sac in the human embryo. Kittens sometimes show two cords of venous origin. A preparation presented recently to the college collection by Mr. J. D. Malcolm, shows a cord-like remnant of the artery of the yolk sac in the adult, but the cord had lost its connexion with the umbilicus.

REFERENCES.

- ¹ Birmingham, A.: *Journ. of Anat. and Physiol.*, 1899, vol. xxxiii, p. 10.
- ² Pollard, Bilton: *BRITISH MEDICAL JOURNAL*, 1907, vol. i, p. 1039.
- ³ Taylor, Wm.: *Ibid.*, 1909, vol. ii, p. 193.
- ⁴ Butlin, H. T.: *Ibid.*, 1903, vol. ii, p. 64.
- ⁵ Riebold, G.: *Virchow's Archiv*, 1908, Bd. 192, p. 126.
- ⁶ Hebb, R. G.: *Trans. Path. Soc. Lond.*, 1898, vol. xlix, p. 88.
- ⁷ Denyer, S. E.: *Journ. Anat. and Physiol.*, 1904, vol. xix, p. 1296.
- ⁸ Falconer, A. W.: *Lancet*, 1907, vol. i, p. 1296.
- ⁹ Rolleston, H. D., and Fenton, W. J.: *Journ. of Anat. and Physiol.*, 1900, vol. xv, p. 110.
- ¹⁰ Lewis, F. T., and Thyng, F. W.: *Amer. Journ. of Anat.*, 1908, vol. vii, p. 489.
- ¹¹ Clogg, H. S.: *Reports, Society for Study of Diseases of Children*, 1908, vol. viii, p. 221.
- ¹² Thomson, Alexis: *Edin. Med. Journ.*, 1908, vol. xxiii, p. 304.
- ¹³ Jackson, C. M.: *Journ. Anat. and Physiol.*, 1908, vol. xlii, p. 219.
- ¹⁴ Johnson, E. Angus: *Australian Med. Gaz.*, 1906, vol. xxv, p. 633.
- ¹⁵ Skirving, A. A. Scot: *BRITISH MEDICAL JOURNAL*, 1907, vol. i, p. 256.
- ¹⁶ Telling, W. H. M.: *Lancet*, 1908, vol. i, p. 843.
- ¹⁷ Mitchell, P. Chalmers: *The Intestinal Tract of Mammals, Trans. Zool. Soc.*, 1905, vol. xvii, p. 437.
- ¹⁸ Meckel, Johann F.: *Handbuch der pathologischen Anatomie*. Leipzig, 1812, p. 553.
- ¹⁹ Gray, H. T.: *BRITISH MEDICAL JOURNAL*, 1907, vol. ii, p. 823.
- ²⁰ Schwalbe, Ernst: *Die Morphologie der Missbildungen des Menschen und der Tiere*, Part III, Jena, 1909.
- ²¹ Jordan, H. E.: *Anat. Anz.*, 1907, vol. xxxi, p. 291.

Memoranda:

MEDICAL, SURGICAL, OBSTETRICAL.

A CASE OF FOREIGN BODY IN THE OESOPHAGUS REMOVED BY THE DIRECT METHOD.

AN elderly gentleman whilst taking his lunch felt a piece of bone pass into the oesophagus and become fixed there; he was unable to take any more food, and as he was suffering great pain he went to the hospital. No foreign body could be seen by the ordinary laryngeal examination; the probang was therefore passed several times, but no foreign body was extracted, nor did the instrument catch on anything. On examination in the x-ray room with the screen no foreign body was seen. He, however, persisted that he could feel it there, and he was sent on to me. On examination both arytenoid regions were seen to be swollen, and there was a small wound on the left. As the patient said that this was where the pain on swallowing could be felt, and as no foreign body had been revealed by the x rays, I thought that this would probably account for the pain, and I therefore advised him to wait a few hours before having any further examination.

The pain continued to increase; I therefore had him anaesthetized, and by means of a Brüning's tube I was able at once to see and extract a large piece of bone from a point about 2 in. down the oesophagus. The bone was firmly fixed right across the oesophagus, and had to be broken in half to be removed; it was about 1½ in. long and was a piece of the temporal bone with a large zygomatic process, which was embedded firmly in the anterior wall of the oesophagus. After the removal the patient made a rapid recovery.

The case is reported, first because of the fact that the x rays showed no foreign body, and secondly on account of the ease with which foreign bodies in the oesophagus and the air passages can be seen and removed by this method.

GEORGE N. BIGGS, M.B., B.S.

Surgeon to the Ear and Throat Department, Evelina Hospital for Sick Children; Assistant Surgeon, Ear and Throat Department, Seamen's Hospital, Greenwich.

London, W