

Section of Surgery.

SUB-SECTION OF PROCTOLOGY.

President—Mr. J. P. LOCKHART-MUMMERY, F.R.C.S.

DISCUSSION ON DIVERTICULITIS.¹

Dr. W. H. MAXWELL TELLING (Leeds).

I AM very sensible of the honour you have done me in asking me to open a discussion on diverticulitis, a subject in which the Sub-section of Proctology has naturally a very special interest, but of which a full practical knowledge should be possessed by every abdominal, gynæcological and genito-urinary surgeon, as well as by physicians and morbid anatomists. In the short space of time which introductory remarks should occupy I will concern myself with the broad lines of the subject and mainly in its clinical aspects.

In 1917, when last reviewing the subject, I wrote² : "Diverticulitis is a condition which has now passed out of the realm of doubt and uncertainty into that of proved and accepted fact. It has an important place in medical literature, and in the experience of every operating surgeon of large practice. This last statement is not as yet true of all clinicians, some of whom are still apparently unaware of the condition, and not a few of its frequency and clinical importance. Not until a morbid condition is described in all the ordinary student's text-books³ of medicine and surgery can it be said to have attained complete recognition, and this is not yet the case with diverticulitis." This is practically the situation to-day.

¹ At a meeting of the Section, held January 7, 1920.

² *Brit. Journ. Surg.*, 1917, iv, pp. 468-530. To this article reference may be made for a detailed study with analysis of cases.

³ A small paragraph first appeared in the 1910 edition of "Osler's Medicine."

Diverticulitis means any inflammatory change in any diverticulum or series of diverticula. In practice, however, usage has restricted the term to the inflammatory changes and secondary pathologic processes generally occurring in or in connexion with a *certain type of diverticulum*. This type is the secondary, acquired, multiple, false diverticulum of the large bowel, particularly and nearly always found in the sigmoid flexure. The diverticula occur mainly in the lower part of this structure, in small or great numbers, but may be found elsewhere, as in the descending colon, the other flexures, the cæcum, the rectum, or throughout the entire large bowel. They may be limited to these special positions, though when occurring therein are more usually associated with sigmoid lesions as well; if limited to them they may give rise to puzzling and anomalous symptoms. The cæcal cases, especially, are of considerable interest, and merit much more attention and investigation than they have already received. Occasionally there is a widespread tendency to diverticulum-formation throughout the whole intestine. For convenience, however, I shall confine my remarks to the typical lesion as it occurs in the sigmoid flexure.

Historically, diverticulitis may fairly be said to be a new subject. Odd specimens had been described from time to time during the last century, but such descriptions were "buried" and isolated, and the clinical aspects of the lesion were for all practical purposes unknown.

In 1898 Graser¹ described examples associated with fibrous hyperplasia, causing stenosing tumour formation—*peri-diverticulitis*: similar cases were then described in America, and Patel,² in France, drew particular attention to the more acute inflammatory lesions—sigmoiditis and peritonitis. I observed my first case in 1899, and finding nothing about it in the literature, or even anyone who was familiar with the condition, I thence onwards made it a practice to examine almost every sigmoid flexure personally at the autopsies I made. The result was the accumulation of a considerable amount of material. In 1907 Moynihan³ published the first case in England of the Graser-tumour type, and this induced me to analyse and classify my cases. This I did in 1908⁴ and this was the first time the subject had been treated as a whole and the various pathological findings and clinical

¹ *Centralbl. f. Chir.*, 1898, xxv (*Bericht. ü d. Verhandl. Deutsch. Gesellsch. f. Chir.*), p. 140.

² *Lyon Chir.*, 1911, v, p. 121.

³ *Edin. Med. Journ.*, 1907, xxi, p. 228.

⁴ *Lancet*, 1908, i, p. 843.

symptoms correlated, or that any complete arrangement and classification had been attempted. That classification has been, in essentials, accepted by almost all subsequent writers and observers, and writing now, twelve years later, when a very considerable number of cases has been observed and recorded, I have no important modification to offer.

The reason that this early "stabilization" of the subject was possible is this: Given the occurrence of a tendency to the formation of multiple hernial out-pushings of the mucosa in the sigmoid flexure, every secondary process that does in fact occur may be logically deduced *a priori* by general pathological comparison and study. I am not proposing to deal with the vexed question of *why* these diverticula occur in the first place except that there is no doubt that they are largely, if not entirely, due to increased pressure within the bowel. Constipation, therefore, plays an important part, but I feel convinced that flatulent distension, often co-existing, of course, has a rôle that cannot be overlooked and needs more study.

A knowledge of the anatomy of these diverticula is of the first importance in understanding the secondary pathologic processes and also in detecting them at all, either in the deadhouse or at operation. At this point the inquiry is pertinent as to how it comes about that the condition has for so long escaped practical recognition, having regard to the large number of cases recorded—not a tithe of those observed—since 1898. The answer is, I think, to be found in three facts. Firstly, the majority of demonstrators of morbid anatomy fail to devote special and personal attention to the sigmoid flexure and perhaps to those surgical autopsies in which, from their point of view, the surgeon has "spoiled" the abdomen generally and a specimen in particular by his manipulations: particularly when the structures operated on have been more or less inflamed, adherent and "mixed-up." Secondly, the diverticula themselves are "adepts" at concealment: to this I will return later. Thirdly, the secondary pathologic processes are liable to be so extensive and disproportionate to the comparatively insignificant diverticula as to hide the true nature of the case from any but patient and skilled observers. This must be the general experience of all who have studied a series of specimens *in situ*.

The second of these points, the "self-concealment," turns upon the anatomy of the diverticula. Firstly, they are small, varying from minuteness up to the size of the last joint of the little finger; more commonly they are one-third to one-fifth this size. Their apertures are often minute, from $\frac{1}{16}$ in. to $\frac{1}{8}$ in. in diameter, and these apertures

usually occur in two rows, mostly opposite the appendices epiploicæ, and often completely concealed by the rugosa mucous membrane. On the outside of the gut the diverticula are seldom observed except by the trained eye, because (1) they mainly enter the appendices epiploicæ as stated, and (2) the gut in which they occur is very frequently fat-laden, necessitating careful dissection to discover them at all. The occurrence of adhesion to other structures and of peridiverticular hyperplasia tends still further to conceal and almost to obliterate their presence. Even so, the fact that isolated observations on them for over a century should have failed to lead to complete recognition is a little remarkable but none the less a fact.

I am stressing these anatomical points rather carefully, as they must be fully appreciated by every operating surgeon if he hopes to recognize the condition at the time of the operation.

Once the diverticula are "in being" the whole series of possible consequences depends upon the following three facts: (1) being formed by pressure from within they tend to enlarge; (2) they tend to harbour fæcal or other harmful contents; and (3) as a consequence they tend to undergo various secondary pathologic processes. In their enlargement they become flask-shaped, with a bottle-neck; this bottle-neck may greatly elongate, its lumen remaining very narrow. This elongation is brought about by *peridiverticular hyperplasia*, which often pushes the "flask" to its circumference, where it sits on the surface of the tumour and works special mischief of other kinds, such as adhesion, perforation and fistulous communication.

The narrow mouths tend to promote the *retention of fæcal contents*, soft or forming actual concretions. Here analogy with appendicitis will largely help us to prophesy results, except in regard to the remarkable hyperplastic peridiverticulitis. The fæcal contents form a bacterial nidus, a reservoir of toxins, and a source of mechanical irritation. As a result secondary changes supervene; if not, the condition remains a harmless pathological curiosity and gives rise to no symptoms or trouble. Perhaps the large majority of instances are largely or entirely innocuous.

The main secondary processes which do occur, separately or variously combined, are:—

- (1) Ulceration of the mucosa of the diverticula.
- (2) Perforation as a consequence.
- (3) Adhesion to other structures, which, when combined with (2), leads to fistulous communication.

- (4) Peridiverticular fibrous hyperplasia leading to tumour formation and, as a sequential result, stenosis of the bowel.

Confining our attention to these main and usual secondary processes, which, as has been stated, may be variously combined, a few moments' consideration will show how protean and puzzling the resulting clinical manifestations may be. In the first place mucosal ulceration will weaken the wall of the sac. This will facilitate perforation, and a concretion will be specially liable to be driven through at any time of increased pressure or violent effort, causing a local or general peritonitis. In quite a number of cases this has actually happened.

The mucosal ulceration also sets up inflammation on the outer surface of the diverticulum, leading to adhesions. These *may* produce no important results, but *may* produce vesical or pelvic syndromes or an acute intestinal obstruction by band or kink. Adhesions *plus* perforation lead either to local abscess, with its varied symptoms, signs and sequential risks and possibilities, or to fistulous communication with other viscera, of which that with the bladder is the commonest, most interesting, and surgically the most important instance.

The culminating interest is reached, however, in the production of the fourth type of lesion, the *peridiverticular hyperplasia*. This may exist with mucosal ulcerations of the diverticulum but not infrequently occurs without it, and is a common and characteristic result, the one which first led to a systematic investigation. It is undoubtedly due to a chronic leakage of toxins or bacteria, or both, through the sac walls, producing a hyperplastic fibrous-tissue formation somewhat similar to that found in a hyperplastic tuberculosis of the cæcum, or more closely resembling a scirrhus cancer. Because of the hyperplasia, which may amount to an inch or more in thickness on section, a tumour is produced; because it is fibrous the tumour contracts and stenoses the bowel, tending towards chronic intestinal obstruction. This thickening and stenosis may be so local as to make an annular stricture and it will be realized how close is then the mimicry of carcinoma. In this way doubtless many of the cases of so-called "cured" cancer in this region may be explained, as well as the placing on museum shelves examples of peridiverticulitis labelled cancer. Others besides myself have found them.

There is, however, a very special relationship of the condition to true carcinoma. A simple peridiverticular stenosis (or possibly other diverticular lesion) may develop carcinoma secondarily, as in the case

of a chronic gastric ulcer. A small number of cases have now been put on record, and since my last records were published in 1917 I have had a further case. The patient was riding and felt a sudden pain in the left iliac fossa followed by temperature and signs of inflammation. I made a diagnosis of perforative diverticulitis and Sir Berkeley Moynihan operated and confirmed, finding multiple diverticula—one of which had perforated and set up general peritonitis. There was also some thickening and stenosis but no naked-eye evidence of malignancy. A year later a second surgical inspection was made and malignant disease was then obvious and inoperable.

It is not too much to say, therefore, that no surgeon ought to decide about or operate on a supposed carcinoma of the sigmoid flexure without an accurate knowledge of what may be termed "diverticular possibilities," nor ought any such tumour removed by operation to lack a complete and *skilled* examination for the presence of diverticula. It was only by this means that Moynihan detected and recorded the first of such cases in the English literature.

We can usefully divide the secondary processes into two main groups: (a) Mechanical (mainly), and (b) inflammatory (mainly). Both processes may go on in the same case, just as there may be present together varying types of inflammatory reaction.

(a) *Mechanical*.—(1) Formation of faecal concretions in the diverticula. (2) Torsion of the diverticulum. (3) Lodgment of foreign bodies within the diverticular sacs. (4) Perforation.

(b) *Inflammatory*.—(1) Diverticulitis: (i) gangrenous; (ii) acute; (iii) sub-acute; (iv) chronic; (v) latent. (2) Passage of organisms without perforation. (3) Peridiverticulitis—chronic proliferative inflammation with tendency to stenosis of the bowel. (4) Perforation of the diverticula, giving rise in particular to: (i) general peritonitis; (ii) local abscess; (iii) fistula, especially into the bladder; (iv) suppuration in a hernial sac. (5) The formation of adhesions, especially to: (i) the small intestine; (ii) the bladder; (iii) the female genitalia. (6) Chronic peritonitis, local. (7) Chronic mesenteritis of the sigmoid loop. (8) Metastatic suppuration. (9) The secondary development of carcinoma.

By the aid of this pathological series it is not difficult to forecast the main clinical symptoms and also to surmise that they will be liable to be variable, complex and puzzling. This is so in fact, as a study of case records abundantly proves. At the same time the majority of cases conform more or less to the following types: (1) Inflammatory trouble

or tumour in the left lower quadrant of the abdomen; (2) general peritonitis; (3) vesicocolic fistula; (4) pelvic syndromes; (5) intestinal obstruction; (6) mimicry of carcinoma.

The frequency of tumour or abscess formation in association with any or all of these is considerable (about 30 per cent.) and one may say that in any case from the age of 30 onwards, presenting these symptoms, calls for mental reservation as to the possibility of a diverticular origin, and in some instances the diagnosis can be and has been made with certainty and accuracy.

As general clinical points it must be remembered that cases occur mostly at or after middle age (though a few cases in early life have been noted), in males more frequently than females; usually with a history of constipation and very seldom causing blood in the stools. A few comments are called for on some of the foregoing clinical types of case.

Inflammatory Trouble, more or less acute, in the Left Lower Quadrant of the Abdomen.—Cases of this type constitute by far the largest group. Erdmann has gone so far as to say that the occurrence of a left-sided pain, with mass or not, but with tenderness and rigidity, is practically pathognomonic of diverticulitis. This is the extreme view, favoured by the supporters of the almost exclusive rôle of diverticula in inflammatory troubles in this quarter. Fitz, in 1912, said that the cases comprised in this "inflammatory" group made a fairly complete picture of what must be recognized as a new disease of the lower abdomen—diverticulitis of the left quadrant, analogous to appendicitis of the right quadrant. Bladder and pelvic symptoms are not uncommon. Various sub-types of the inflammatory group may be distinguished and a useful clinical classification is as follows: (i) Acute and fulminant (gangrenous); symptoms practically identical with acute right-sided appendicitis. (ii) Recurrent; acute or sub-acute attacks over a long period. (iii) Cases ending in spontaneous recovery. (iv) Protracted cases—those which continue till the clinical picture is changed by one or other of the following developments: (a) simulation of carcinoma; (b) intestinal obstruction (acute or chronic); (c) bladder perforation; (d) general peritonitis; (e) incidence of pelvic symptoms.

Trauma.—The mode of onset of many of the acute cases is of interest as showing the great part which trauma of various kinds may play. It has a definite diagnostic value when diverticulitis is under suspicion and acts as an exciting cause of, at any rate, the acute manifestations. These have occurred while straining at stool, during the

administration of an enema, following a dose of castor oil, jolting in a motor car, following a heavy meal, while lifting a weight, jumping or hunting, and during an abdominal operation. In this group pain of one kind or another (often recurrent and colicky) and tenderness are very frequent. Tumour-formation has been noted in 30 per cent. of the cases, and the tumour is not infrequently and then characteristically variable. Abscess-formation is very frequent, consequently fever and leucocytosis are often present. Bladder and pelvic symptoms are not uncommon. Apart from actual fistulous communication with the bladder, which constitutes a separate clinical group, there are frequently symptoms of bladder irritability, probably due to the nearness of inflammatory foci or to actual adhesion. Pelvic symptoms are of some frequency, and sometimes make the clinical picture.

Vesico-colic Fistula and Bladder Symptoms generally.—In a recent review¹ Bryan has stated that “diverticulitis” is the most frequent cause of sigmo-vesical fistula. Moynihan was the first observer in England to emphasize this fact. He wrote in 1907: “The formation of a vesico-intestinal fistula seems to be one of the tendencies of a perforated false diverticulum; a search through the literature has shown us that it is far more common than was supposed. In cases where a hard growth in the intestine is accompanied by the passage of flatus and fæces by the urethra, a diagnosis of carcinoma seems irresistible, yet the *probability* is that the growth would be simple, and that the cause of the fistula would be a false diverticulum which had burrowed its way through all the coats of the bowels, and thence through the wall of the bladder which had become adherent.” Experience has abundantly confirmed the truth of this statement, and its recognition has been followed by some brilliantly successful cases, cured by operation after long periods of suffering.

Pelvic Syndromes.—Much has been written in recent years about the close pathologic relationship between the sigmoid flexure and the other pelvic viscera. Much of it has been without any or a very extensive knowledge of the rôle of the diverticulum. It is not surprising to find diverticulitis increasingly frequent in the practice of gynecological surgeons. Pelvic symptoms of one kind or another existed in 7 per cent. of my collected cases, and a number of examples have been placed on record in which the symptoms were entirely pelvic, bowel symptoms being absent. There is no doubt that Shoemaker² strikes the right

¹ *Ann. Surg.*, 1916, lxiii, p. 353.

² *Ann. Surg.*, 1914, lix, p. 422.

note in saying that, in any suspected case of pelvic or utero-ovarian disease, a routine and thorough examination of the recto-sigmoidal bowel and its functions is just as important as a vaginal and uterine examination.

Diagnosis.—This can only be made after a careful consideration of all the facts of the case. Inflammatory lesion in the left lower quadrant in a person of middle or advanced age carries with it a strong *prima facie* possibility of a diverticulitis being the cause, but, beyond this, exact diagnosis is often difficult, and all special aids to diagnosis may have to be requisitioned. These include: (1) The sigmoidoscope, which has been disappointing in the main in this condition, though perhaps some members may have had more fortunate experience; (2) the cystoscope, which has been of particular value in a small number of cases; and (3) examination by X-rays. This last procedure holds out most promise and has been greatly developed during the last few years. As may be expected, the technique is not of the easiest, and there are many fallacies in the appearances noted, but there is no doubt of the general diagnostic value. The outstanding condition calling for differential diagnosis is carcinoma. It may be and often is impossible, not only before operation but at operation. The following summary of the chief points differentiating diverticulitis from carcinoma may be of use:—

(1) The absence of the “ shadows of malignancy ” from the general picture.

(2) Tendency to obesity, and maintenance of good nutrition generally.

(3) Long history of attacks of abdominal pain in the left lower quadrant.

(4) History of tumour formation with subsequent disappearance.

(5) Absence of blood (visible to naked eye) in stools, over a prolonged period.

(6) Presence of a vesical fistula, in which malignancy can be excluded by cystoscopy.

(7) Negative sigmoidoscopy as regards malignant disease.

(8) X-ray demonstration of diverticula.

(9) Pyrexial attacks.

(10) Examination of blood: the presence of neutrophilic leucocytosis and the absence of the specific nuclear changes characteristic of cancer.

In carcinoma of the sigmoid, loss of flesh is early, pain and tenderness are late, and are often preceded by tumour. There are certain other

conditions which have to be considered in arriving at a differential diagnosis. They are: (a) sigmoiditis, (b) hyperplastic tuberculosis, (c) actinomycosis, (d) syphilis, (e) pelvic conditions generally.

Treatment.—This is comprised in a single word—surgery—unless operative interference is specially contra-indicated. As a physician I shall not venture to discuss particular surgical procedure, but confine myself to a few general points. In view of the potentiality for mischief of diverticula, all diverticulum-bearing gut should be removed. At operation search should be made whenever possible for further diverticula. Recurrence after operation has occurred, presumably from neglect of this point. There seems to be a special liability to post-operative peritonitis, possibly due to the chronic infection of the inflamed tissues in some cases. Care should be taken in handling the gut, as at least one instance has occurred of rupture of a diverticulum by surgical traumatism. The good results already obtained in certain bladder fistulæ should stimulate surgeons to deal with such cases.

Lastly, no case of supposed carcinoma of the lower bowel must in future be regarded as inoperable, either before or at laparotomy, unless diverticulitis has been remembered, fully considered, and systematically investigated.

Sir JOHN BLAND-SUTTON.

Thirty years ago colic sacculi were mainly regarded as pathological curiosities, and our knowledge of their potentialities for evil is a direct result of surgical enterprise. My interest in them was aroused when trying to find an explanation of the phenomenon known as “spontaneous disappearance of abdominal tumours.” This matter was discussed in the Royal Medical and Chirurgical Society in 1894 by Mr. Greig Smith,¹ and increasing experience in abdominal surgery enabled me to learn the part played by colic sacculi in producing localized swellings in the belly, which sometimes disappear by expectant treatment. The phrase “spontaneous disappearance of abdominal tumours” disappeared from surgical phraseology when surgeons learned that acute and chronic diverticulitis, or sacculitis (names as ugly and cacophonous as appendicitis) mimic many important lesions, especially acute and chronic appendicitis, cholecystitis, tumours of the stomach, subdiaphragmatic abscess, perigastric abscess,

¹ *Med. Chir. Trans.*, 1894, lxxvii, p. 139.