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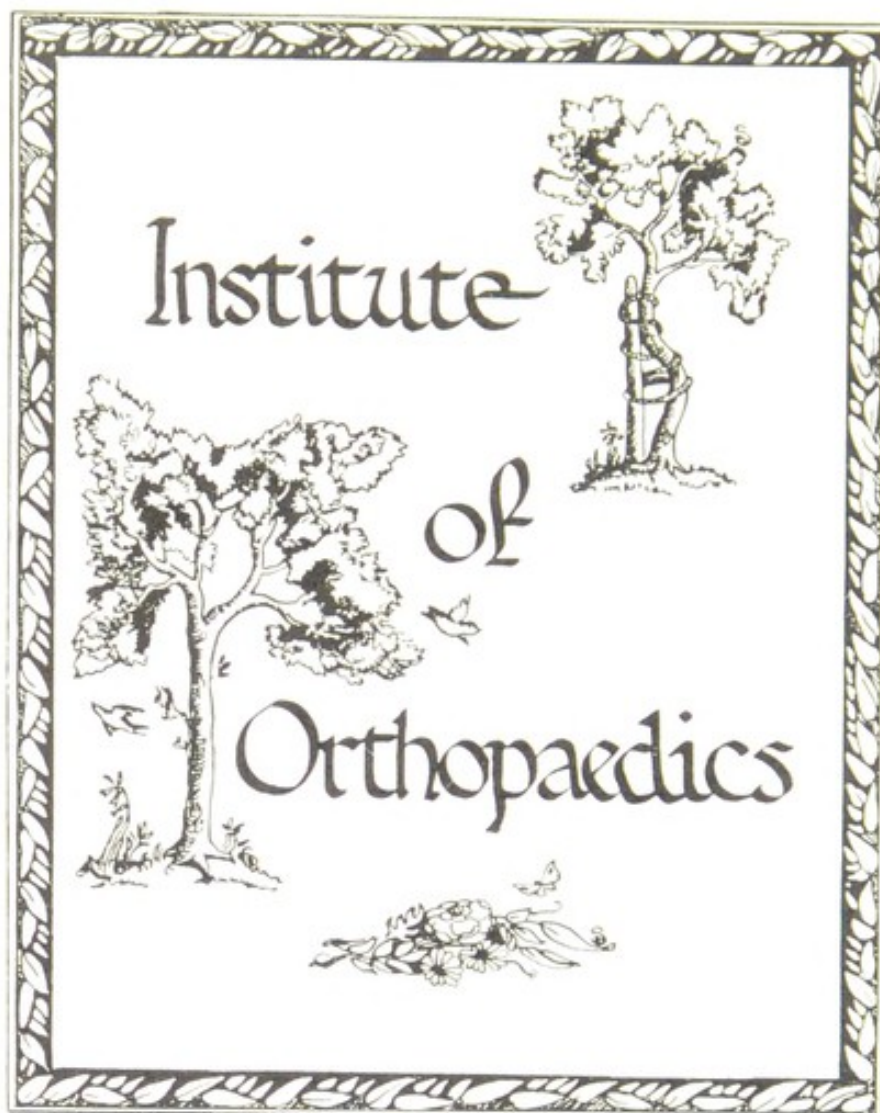
APPENDICITIS

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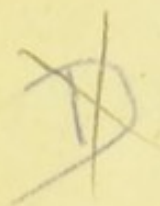






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# APPENDICITIS.

BY

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## P R E F A C E.

THE object of this monograph is to present a concise account of Appendicitis, its modern pathology and treatment. Especial stress has been laid upon the subject of surgical interference.

The writer wishes to express his indebtedness to the writings of Mr. F. Treves, to many American authors, and above all to the superlative monograph of Dr. H. P. Hawkins, whose conclusions have been freely drawn upon, and whose weighty words are frequently quoted.

A. H. TUBBY.

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# APPENDICITIS.

## CHAPTER I.

### INTRODUCTORY.

THE importance of the pathology of inflammatory affections occurring in the right iliac fossa has been appreciated fully only within the last twelve or fifteen years. An article by Fitz,<sup>1</sup> very complete on the frequency of the affection, the presence or absence of foreign bodies, the probability and time of perforation, and the necessity of surgical interference in severe cases, focussed the attention of observers on the appendix. McBurney<sup>2</sup> in 1891 vigorously advocated circumspect surgical measures, and since then the treatment of this affection has entered more into the province of the surgeon than of the physician, and should be regarded rather as a surgical than a medical affection. The names of those who have been prominently associated with the great advance of the past few years are well known to all students of modern surgical literature. Although the subject of appendicitis demands a large share of attention in the journals of to-day, yet it would be unseemly to withhold mention of many pioneers in the same

<sup>1</sup> 'Perforative Inflammations of Vermiform Appendix,' *Amer. Journ. Med. Sci.*, 1886, and *Trans. Assoc. Amer. Phys.*, 1886.

<sup>2</sup> *Annals of Surgery*, 1891, vol. xiii., p. 233.



field who regarded the appendix with justifiable suspicion. Among such may be found the names of Wegeler (1813), Vicq d'Azyr (1814), Lonyer-Villernay (1824), Mélier (1827), Ferrall (1831), and, greatest of all, Dupuytren (1833), who ascribed the origin of inflammatory affections in the right iliac fossa to the cæcum, a view that found support until a recent date. Since Dupuytren wrote, other names have appeared in connection with the matter; some of these are: Burns (1837), Albers (1838), Rokitansky (1843), Lewis (1856), Leudet (1859), Willard Parker (1867), and With (1879). Sir Samuel Wilks pointed out many years ago the relationship of so-called typhlitis to the appendix.

**Nomenclature.**—The term 'appendicitis,' although etymologically incorrect and cacophonous, yet has the merit of directing attention to the exact origin of the affection under notice. Some surgeons, notably Mr. F. Treves, prefer the title 'perityphlitis'; others would introduce new and strange-sounding titles, such as 'epiphyaditis' and 'epityphlitis.'<sup>1</sup> Inasmuch as the cause of the inflammation, catarrhal, phlegmonous, or suppurative, is a diseased condition of the appendix in nearly every case, and the term 'appendicitis' is sanctioned by custom, it will be retained throughout this monograph.

**Grades of the Affection.**—While at the bedside an exact classification is of little or of no differential and clinical value in estimating the true state of affairs, yet for descriptive purposes it is necessary to group cases, and a classification will be given, but with a caution that it is not possible to pigeon-hole any particular case. 'There is no disease so protean in its nature as appendicitis' (Hawkins). At the beginning of an attack, indeed, for the first forty-eight hours, it is impossible to foretell what will be the outcome. A patient presenting at the commencement of illness little local and constitutional disturbance may die on the third or

<sup>1</sup> Küster, *Cent. f. Chir.*, No. 50, 1898.



fourth day with an abdomen full of pus. The attack may begin in a more marked manner, and the severity of the symptoms gradually or suddenly increase until a large circumscribed abscess is formed or general peritonitis ensues. Again, the attack may come on with extremely acute symptoms and the early appearance of a large swelling, yet all disturbance subsides rapidly, and the patient is well on to recovery by the fifth or sixth day; or the initial symptoms may be so severe as to induce the belief that acute general peritonitis is present, yet the symptoms subside as rapidly as they began. Cases doing perfectly well, apparently, have been known to terminate suddenly and fatally owing to invasion and implication of the whole general peritoneal cavity. Or the evacuation of an abscess fails to relieve the local and constitutional disturbance, and it is not for many days that a further pocket of pus between the intestines is discovered to be the cause of the persistence of symptoms.

The following **classification** from a clinical point of view will prove serviceable:

1. Simple catarrhal appendicitis, accompanied by inflammatory changes in the mucous membrane, and ending in resolution or passing on to the more severe forms.
2. Appendicitis with adhesive inflammation of the peritoneum and ending in resolution.
3. Appendicitis without perforation or gangrene, with the formation of local circumscribed abscess.
4. Appendicitis with perforation or gangrene resulting in acute general peritonitis.
5. Relapsing appendicitis.

This classification, which is a modification of that suggested by Hawkins in his original and scientific treatise of the subject, of which free use will be made in this monograph, has the merit of simplicity, and the demerit that it does not cover all the probabilities presented by



cases. But it is doubtful if any classification can effect this. Treves suggests the following grouping of cases :

1. An ordinary attack, the case ending in resolution.
2. An ordinary attack, the case ending in suppuration.
3. An attack of the mildest type.
4. A most intense and acute attack.
5. Certain peculiar forms of perityphlitis.

But as it is impossible at the beginning of an attack to foretell the course it will take, it is evident that this can merely be of descriptive value and of nothing more, and this Treves acknowledges.

## CHAPTER II.

### ANATOMY OF THE PARTS CONCERNED.

THE most careful and thorough descriptions of the appendix and its relations have been furnished by Treves, Bryant,<sup>1</sup> G. R. Fowler,<sup>2</sup> Lockwood, and Rolleston.<sup>3</sup> The parts needing description are the cæcum and appendix, and the arrangement of the peritoneum in the neighbourhood.

**Anatomy of the Cæcum and Appendix.**—From a comparative point of view, the cæcum of man occupies an intermediate position between that of the herbivora and carnivora. In the former the cæcum is of great length ; in the latter it is small, and sometimes absent. In man a compromise is made between these two conditions. The distal part of the long cæcum of herbivora has ceased to develop early, and this distal part forms the appendix, while the proximal part is the normal cæcum of man. Any structure in the body which fails to attain its full development is always liable to degenerations of various descrip-

<sup>1</sup> *Annals of Surgery*, February, 1893.

<sup>2</sup> *Med. News*, Philadelphia, 1893.

<sup>3</sup> *Journ. Anat. and Phys.*, vol. xxvi.



tions. In the case of the appendix there is an absence of resistance to bacteria, and this absence culminates from time to time in many people in an attack of appendicitis.

With regard to the anatomy of the cæcum, it is that part of the large intestine which is situated below the level of the ileo-cæcal valve, and is always covered by peritoneum, but is not attached by areolar tissue to the iliac fascia. According to Treves, the mesocæcum formerly described has no existence at all. The cæcum is placed more internally than is usually thought to be the case. The apex is just internal to the middle of Poupart's ligament. But the position of the cæcum itself is very variable. Sometimes it is found to the right of the middle line, just above the right sacro-iliac synchondrosis; at other times in the middle line below the umbilicus, or even hung up beneath the liver.<sup>1</sup> A displacement of the cæcum necessarily complicates an attack of appendicitis, both in its diagnosis and treatment.

The appendix is attached to the cæcum at a point  $1\frac{1}{2}$  to 2 inches internal to the anterior superior spine of the ileum, and situated along the line drawn from that point to the umbilicus. This spot is known as McBurney's point, and it is at this spot that pain is most frequently felt in appendicitis. From its origin the appendix may track in one of several directions, so that inflammatory processes originating in the appendix will, when localized, give rise to collections at various spots. As to the direction of the appendix, we are indebted to G. R. Fowler,<sup>2</sup> who examined eighty-three cases in which the appendix lay freely in the abdominal cavity.

<sup>1</sup> G. R. Fowler, *Annals of Surgery*, vol. xix., p. 160, 'Abnormal Position of Cæcum.' The cæcum could not be found in the right iliac fossa, but the transverse colon was found to descend to the level of the pubes, a portion of it occupying the normal site of the ascending colon. The cæcum was finally found immediately behind the liver, and when the liver was held out of the way the diseased appendix could be removed. This condition of things was found in the case of a girl aged fifteen years. Lenander has found the cæcum lying against the spleen in a boy of sixteen.

<sup>2</sup> *Annals of Surgery*, vol. xvii., p. 620, *et seq.*



Its position was as follows: 'In fifty-one it hung down into the lesser pelvis, and I have seen it adherent in women to the uterus and to the ovary, thus complicating somewhat the diagnosis of a relapsing appendicitis. In twenty cases it passed transversely over the psoas towards the sacral promontory. It is in such cases as these that the symptoms are sometimes referred to the left side of the abdomen, and with an unduly long appendix the abscess has appeared on the left side of the middle line. In six it lay freely on the iliacus and psoas. In two it passed upward along the lateral surface of the ascending colon. In three it lay in the mesogastric region, being located transversely. In one it lay in front of the sigmoid flexure on the right side. In other cases the appendix is seen turning up towards the kidney, and if diseased gives rise to what appears to be a perinephritic abscess.'<sup>1</sup> In twenty-two cases in which the appendix, according to Fowler, lay behind the first portion of the colon between this and the

<sup>1</sup> Mynter, 'Appendicitis,' quotes the following statistics:

#### POSITION OF APPENDIX.

Bryant (*Annals of Surgery*, vol. xvii., pp. 164-180), 144 cases:

- 32 behind cæcum.
- 34 on inner side, and downwards towards pelvis.
- 5 straight down in the iliac fossa.
- 9 outward and on outer side of cæcum.
- 1 on inner side high up towards liver.

Hawkins, 100 cases:

- 38 along left border of cæcum or lying on the psoas muscle, pointing upward and inward.
- 26 behind cæcum.
- 17 down in the pelvis.
- 9 outer side of cæcum.
- 6 almost transversely inward across the psoas.
- 4 curled up below the cæcum.

Ferguson, 200 cases:

- 19 outer side of cæcum.
- 11 downward.
- 18 inward.
- 75 in relation with posterior surface of cæcum.
- 77 in such a way that perforation would take place into the retro-peritoneal tissue.



posterior abdominal wall, its relative position was as follows : In four it lay curled up behind the ileo-cæcal junction ; in five it lay directly behind the cæcum ; in six it passed intraperitoneally along the posterior or postero-median surface of the colon ; in two it passed in the same direction, apparently extraperitoneally ; in four it passed in the same direction, but partly extraperitoneally ; in one the fundus of the cæcum turned upwards and backwards, the appendix lying behind it. It is recorded that the tip of an appendix of unusual length has been found lying upon the sigmoid flexure. When inflamed, adhesions to various portions of the viscera may occur and form a strangulating band. The appendix has also been found in the sac of a hernia,<sup>1</sup> and one case is recorded in which an attack of appendicitis took place under such conditions. Charters Symonds (*British Medical Journal*, 1898, vol. ii., pp. 12, 58) mentions a case in which an appendix in the sac of a hernia was found to contain a pin, and Heaton (*ibid.*, p. 1618) records a case of an appendix strangulated in a retroperitoneal fossa.

At the junction of the appendix and cæcum is found the so-called valve of Gerlach, and Bryant has pointed out that in one-half of the specimens taken from both sexes the established form of origin<sup>2</sup> of the vermiform appendix is 1 inch below the ileo-cæcal valve and on the posterior surface of the cæcum, and that it is rarely more than

<sup>1</sup> McAdam Eccles, 'Note on Hernia of Vermiform Appendix,' *Lancet*, 1899, vol. i., p. 1360 ; W. H. Battle, *ibid.*, p. 1631.

<sup>2</sup> Bryant (*Annals of Surgery*, vol. xvii., pp. 164-180) :

#### INSERTION IN 82 MALE CASES.

In 47 1 inch below ileo-cæcal valve posteriorly.

„ 10  $\frac{3}{4}$  inch below and posteriorly.

„ 7  $1\frac{1}{2}$  inches below and posteriorly.

„ 1 just below.

„ 5 1 inch below and at back of valve.

„ 6  $1\frac{1}{2}$  inches below and at back of valve.

„ 1 to the apex of the cæcum.

Much the same in females.



1½ inches from the ileo-cæcal valve. There is no importance to be attached to Gerlach's valve; it neither prevents the entrance of fæcal matter to the appendix, nor, unless diseased, prevents the escape of the normal secretions of that body. With reference to the disposition of the peritoneum in the neighbourhood of the cæcum and the appendix, Messrs. Lockwood and Rolleston describe three distinct fossæ in this situation. Treves, in Clifford Allbutt's 'System of Medicine,' speaks of them thus: 'There are certain peritoneal fossæ about the cæcum, but they possess little or no pathological importance; they may seem to limit inflammatory infusions.' The ileo-colic fossa described by Lockwood and Rolleston is situated between the ascending colon, the ileum, and the mesentery, forming a pocket with the mouth looking upwards and to the left; the ileo-cæcal fossa is placed behind the point of junction of the ileum and the cæcum, and its boundaries are: on the right the mesentery of the ascending colon, on the left the mesentery of the small intestines, and in front the ileum and the cæcum. This fossa is sometimes divided by the mesentery of the appendix into a superior and inferior ileo-cæcal fossa. According to Hawkins, the appendix is frequently found in the ileo-cæcal fossa. Lastly, the sub-cæcal fossa is placed immediately underneath the cæcum, and is less often present than the other two. With regard to the mesentery of the appendix, the mesoappendix, this is rather often seen. The disproportion between the length of the appendix and the length of the attachment of the mesentery to it is very considerable. In some cases it is almost absent,<sup>1</sup> and then the appendix is found closely

<sup>1</sup> Mynter (Appendicitis, p. 21), 'Mesenterium,' quotes as follows:

Hawkins: Mesenterium sometimes absent; appendix quite free.

Wyeth: Mesenterium sometimes partially absent.

Ferguson: Of 200 cases, 77 covered in such a way that perforation could take place only into the retroperitoneal tissue.

Maurin: 112 cases of all ages, all of them completely surrounded by the serosa, and quite free in the abdominal cavity.



adherent to the posterior margin of the cæcum. From this condition it may vary to all lengths, until a complete meso-appendix is met with stretching to the tip; but clinically the importance of the meso-appendix should be carefully noted, since it is due to it that the appendix is so frequently coiled upon itself, and is therefore liable to cystic dilatation, to retention of secretion, and to strangulation. The appendix can be readily identified by noting the fact that the muscular bands on the cæcum are carried down into it, especially the anterior band. This is a point of practical importance in searching for the appendix amongst a collection of adhesions.

**Length of the Appendix.**—If a number of cases be examined in adults, the average length is  $3\frac{1}{2}$  inches; it has been known to vary from 1 inch to  $8\frac{1}{4}$  inches. It is somewhat shorter in females than in males.

**Diameter of the Appendix.**—This is on an average about  $\frac{1}{4}$  inch, and rather less in females.<sup>1</sup> It has been clearly shown that the greater the diameter of the appendix, the more likely is it to contain so-called fæcal concretions.

**Contents of the Appendix.**—Here again we are indebted to J. D. Bryant<sup>2</sup> and to Mitchell.<sup>3</sup> His researches

Bryant: 40 per cent. perfectly free; 60 per cent. shorter or longer mesenteriola.

Kelynack, quoting Lockwood and Rolleston, states that the mesenterium seldom reaches more than one-half or two-thirds. Of 80 cases, 64 along whole length; 2 less than half covered.

<sup>1</sup> Cf. Bryant, *Annals of Surgery*, vol. xvii., pp. 164-180.

<sup>2</sup> *Ibid.* Re contents of appendix. Of 124 cases—

(a) 67 per cent. contained abnormal material.

(b) Abnormal material happens more frequently in male (70 per cent.) than in female (56 per cent.).

(c) Fæcal matter most common: Male cases, 52 per cent.; female cases, 35 per cent.; sex not stated, 28 per cent.

(d) Only fæcal substances or products dependent on inflammation present. No foreign bodies found.

(e) Presence of abnormal material in these cases (124) happened less frequently (67 per cent.) than is commonly ascribed to this condition.

<sup>3</sup> *Johns Hopkins Bull.*, January, February and March, 1899, records that, of 1,400 cases of appendicitis collected from various sources in the last ten years, 7 per cent. had true foreign bodies, not including



give the following results in two-thirds of the 124 cases examined in the post-mortem room. He states that 67 per cent. of the cases showed abnormal material, which is met with more frequently in the male than in the female; that in no instances were there other than faecal substances or products dependent upon inflammation present. In these cases grape-seeds or other bodies foreign to the intestines were not found at all. The abnormal material may consist of faeces, mucus, mucus and faeces, mucus and pus, mucus and gas, pus and faeces, or enteroliths. Of the cases of disease of the appendix which have been operated upon or examined post-mortem, Hawkins says: 'Taking fatal cases, cases that have been subjected to operation, a faecal concretion is found to be the cause of appendicular disease in 29 per cent. of the series, and 35 to 50 per cent. when a large number is taken. But in cases of patients who have not suffered from any signs of appendicitis, and who are subsequently examined on the post-mortem table, the presence of enteroliths is but slightly marked.' Bryant found an enterolith once only in 102 cases coming down into the post-mortem room for causes other than appendicitis. There can be no doubt, however, that occasionally, if the enteroliths be examined, a nucleus may be found which, on examination, proves to be a foreign body which has passed along the intestines. Such foreign bodies are the stones and pips of fruit, and even a pin<sup>1</sup> has been found in an appendicular abscess.<sup>2</sup>

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faecal concretions, which were present in 315 cases. Of 250 cases in Johns Hopkins Hospital in ten years, only one foreign body, viz., the segment of a tape-worm, was found. Osler, in ten years at Montreal, found foreign bodies twice, in one case five apple-pips, and in the other eight snipe-shot. Mitchell collected 28 cases of pins found in the appendix, 19 being males and 9 females. In the majority of cases, rapid perforation and abscess formation followed the initial symptoms.

<sup>1</sup> Cf. Parker Syms, *Annals of Surgery*, vol. xxiii., p. 604.

<sup>2</sup> The following authors may be consulted as to the contents of apparently healthy and diseased appendices: Matterstock, 'Gerhardts Handbuch d. Kinderkrankheiten,' 1880; Krafft, Volkmann's 'Klin Vortrage,' January, 1889.



The **structure of the appendix** approximates somewhat closely to that of the cæcum, but two points are noticeable: the very large amount of lymphatic tissue in the mucous membrane, and the stout thick muscular coats in the wall. These facts are of etiological importance in the production of appendicitis. In some respects the lymphatic tissue by its abundance, its thickness and its aggregation into masses resembles the tonsils; and like them the appendix is prone to take on a suppurative action when invaded by the numerous bacilli which are to be found on the surface of the mucous membrane. The importance of the muscular tissue is considerable, and it is found to be largely mingled with fibrous tissue. The latter becomes hypertrophied under the stimulus of inflammation, and leads to the constricted and cystic<sup>1</sup> condition often found in diseased appendices.

### CHAPTER III.

#### MORBID ANATOMY AND PATHOLOGY.

IN the consideration of the affections of parts which are grouped under the heading of appendicitis, we must consider their pathology in relation (1) to the cæcum, (2) to the appendix, and (3) to the peritoneum.

##### 1. In their Relation to the Cæcum.

In the earlier decades of this century, it was invariably thought that the cæcum was the organ at fault. The pendulum of opinion has now swung almost entirely in the opposite direction, and it is believed that in almost every case the appendix is the primary offender. In fact, some go so far as to believe it to be always so. But it is worth while to examine this point a little more thoroughly. Treves, in his article on 'Perityphlitis' in

<sup>1</sup> Mynter ('Appendicitis,' p. 59), in 75 cases: cystic dilatation in 15; strictures in 22; bends in 5.



Clifford Allbutt's 'System of Medicine,' devotes some space to perityphlitis taking origin from the cæcum, but he freely admits that such cases are very few. He, however, believes in the existence of stercoral ulcers in the cæcum, just as they may under suitable conditions be found elsewhere in the large intestines. The chief causes of perityphlitis, meaning by that term inflammation of the peritoneal and subperitoneal tissues in the neighbourhood of the cæcum, are, according to that writer, perforation by a foreign body, such as a fish-bone or a pin; or the ulceration of the cæcum may arise from tuberculosis, typhoid fever, dysentery or actinomycosis. Treves goes on to state: 'The commonest cause of such cases of perityphlitis as arise in the cæcum is the stercoral ulcer'; and he adds: 'Long-impacted fæcal masses in any part of the colon give rise to catarrh. This catarrh, when of severe degree, serves to produce a spurious diarrhœa, which is seen in cases of obstruction of the lower colon. This catarrh often passes on to ulceration . . . it is no matter of wonder that the stercoral ulcer should be most common in that part of the colon that is the cæcum.' He quotes a case which he believed to be of this nature in which an abscess formed that was incised in due course. The contents were very foul, but no fæces had escaped. Lymph covered the cæcum, but the appendix was apparently sound. It does not seem that the appendix in this case was removed for examination, and we know that apparently healthy appendices<sup>1</sup> on being opened are found to contain

<sup>1</sup> Lanz (*Correspondenz f. Schweiz. Aerzte*, June 15, 1899) states that an appendix, externally to all appearances normal, internally may have undergone such important changes that the life of its possessor is in constant danger. Hence it should be the rule to remove every appendix, whether externally normal or not, when the symptoms have justified such an operation. The following case supports this view: A young girl was seen with a history of having had seven attacks of typhlitis, three of which were with high fever and vomiting. On operating, the appendix appeared perfectly healthy, but was removed. When slit open, two strictures were found, one of which consisted of a cicatricial



abnormal material, so it seems that the case quoted does not altogether bear out his contention, nor is it possible to quote with any certainty a case of somewhat similar nature which I have met with recently. It was that of a lady aged forty, who five days previously to my seeing her began to suffer from pain in the right iliac fossa and occasional vomiting and obstinate constipation. She was placed in bed, and given opium by her medical attendant. When I saw her she was free from pain; there was no rise of temperature; her pulse was 80, and beyond constipation and the feeling of heaviness in the right iliac fossa, she felt quite well. On examining the right iliac fossa, I could distinctly make out a mass which gave one the impression of impacted fæces. It had a doughy feel, and there was considerable tenderness about the mass. She was removed to Westminster Hospital, where Dr. Allchin kindly saw her with me. He thought the nature of the case was a perityphlitis arising from septic absorption of retained fæces in the cæcum, and we decided to treat her by enemata; this brought away a large quantity of fæces: all pain and trouble soon subsided, and there has been no recurrence. It is not at all improbable that the long retention of fæces in the cæcum may rouse into activity the virulent properties of the *Bacillus coli communis*, so that septic absorption may take place, and protective inflammation may occur in the peritoneum in the neighbourhood. But I should not be prepared myself to dogmatize about any case being cæcal or appendicular in origin unless the appendix had been removed and carefully examined to show that no disease was present in it.

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thickening of the whole wall, and the other of a circular granulating ulcer of the mucosa. There was no enterolith.

A similar case occurred to the author—that of a little girl aged eleven, who had had six attacks of appendicitis. Externally and before removal the appendix appeared slightly thickened only, but on slitting it open there was a stricture at its centre, and behind it a spot where the wall was so thin that it was formed only of peritoneum.



## 2. In their Relation to the Appendix.

In discussing this heading, the following points may not unfitly be reiterated: (a) The appendix is functionally useless, but is so placed that faecal matter can readily find an entrance into it. (b) Its mucous membrane and its submucosa are richly endowed with lymphatic tissue, and have a considerable amount of absorptive power. Its surface is constantly covered by large numbers of the *Bacillus coli communis*, and this bacillus, under conditions of which we appear to be at present ignorant, takes on a virulent action which gives rise to peritonitis. It has, however, been ascertained that in rather more than half of these cases of acute peritonitis a pure culture of the colon bacillus can be obtained. (c) The muscular wall is very thick, and has intermixed with it a large number of fibrous elements. If inflammation occur in it, fibrous tissue is enormously increased in it, and hence encroachment follows on the lumen of an already narrowed appendix. Still further contraction leads to permanent strictures, and to kinking of the appendix. This kinking is often aggravated by the shortness of the mesentery, and by adhesions of the neighbouring peritoneum. In certain individuals the entrance aperture of the appendix is large, and if this exist as a congenital peculiarity, it may explain the incidence of the disease in families.

The following conditions of the appendix are met with: (1) A chronic catarrhal condition of the mucous membrane with some thickening of the submucosa and of the muscular coat. (2) A cystic condition. (3) Obliteration of the lumen of the canal, which may be—(a) partial, producing the cystic condition, or (b) complete. (4) Ulceration: (a) Non-perforative; (b) perforative. (5) Localized gangrene. (6) Total gangrene of the appendix.

It should be remembered that every degree of inflammation of the peritoneum and of the surrounding structures



may arise from any one of the foregoing, and they therefore merit consideration at some length.

**The Catarrhal Form.**—Hawkins thinks that the catarrhal form is not associated with faecal concretions or other extraneous matter. But this point is doubtful when we remember the extraordinary expulsive power possessed by an appendix which is only slightly damaged in its muscular walls. Dr. Parker Syms<sup>1</sup> records the following: 'During ovariectomy the vermiform appendix came into view, and was removed because of its great length—over 5 inches. After its removal it continued for almost ten minutes to squirm on the plate, and finally a formed faecal movement took place from it.' It is, therefore, highly probable that in these cases of catarrhal appendicitis a small mass of somewhat hardened faeces is from time to time lodged in the appendix until it excites irritation, and is then forcibly expelled with some sharp pain. It may be that such cases as these have originated the expression 'appendicular colic,' a condition as to the existence of which one must be sceptical in the absence of more extended observations. The importance of recognising the catarrhal form is twofold: (a) That it is probably the precursor of more profound changes in the appendix; (b) that an ordinary catarrhal appendicitis may give rise to extensive peritonitis. The morbid changes are very similar to those found in other parts of the intestines. The epithelium is shed, and the submucosa and muscular coat infiltrated with leucocytes and plasma cells. If this process be long continued, permanent thickening of the mucous membrane, submucosa, and muscular tissue of the organ occurs, with the formation of strictures, and if the process be extended over the whole appendix complete obliteration may follow. It is probable, however, that in a certain number of cases the epithelium may be renewed, the patients not suffering

<sup>1</sup> *Annals of Surgery*, vol. xvii., p. 675.



further. But the importance lies in the shedding of the epithelium. Once it is damaged or shed the *Bacillus coli communis* finds an entrance into the tissues, and then disastrous results follow. If the secretion of the appendix be examined during a catarrhal attack, it is found to be mucoid or muco-purulent, with an evil odour, and a culture of the colon bacillus found therein proves to be extremely virulent; so that from a mere catarrhal attack necrosis may take place, not necessarily of the surface, but deeper in the tissues, and thence spread to the peritoneum. The steps of the processes between the catarrhal and cystic form are sufficiently obvious. Cysts are usually found at the cæcal end of the appendix, and there may be one or more of them. The part beyond the constriction is dilated into swellings of various sizes.

Sir S. Wilks has recorded one containing 4 ounces of mucus which was odourless. But more often the contents are not so harmless. They become foul, and if the cyst give way perforation follows, with the result of localized abscess or general peritonitis. Not only do such cysts arise from changes in the mucous membrane, but also from kinking of the appendix, due either to adhesions in its neighbourhood or to the shortness of its mesentery, or to the formation of peritoneal adhesions. So long, however, as the fluid in the cyst remains odourless and non-virulent, no other symptoms are liable to arise except occasional attacks of pain in that neighbourhood. If once septic changes occur in the contents of the cyst, the epithelium, being already damaged, permits absorption, with the result that ulceration, or necrosis or gangrene follows.

**Obliteration of the Appendix.**—This may be partial—then the cystic condition follows—or it may be complete. A complete obliteration may be regarded as a cure by Nature. Such cases are, unfortunately, rare, and before so desirable a result is obtained the patient has to pass



through many successive attacks of appendicitis. Deaver<sup>1</sup> remarks that he had found complete occlusion in 13 cases out of 200. This would, however, seem to be too large a number.

McBurney<sup>2</sup> quotes the following case of a male, aged thirty, who had, on the whole, good general health, but had been troubled for the past three years by frequent, almost continual, sensation of burning pain in the region of the appendix, but had never had an attack of acute appendicitis. An operation was performed: the appendix was found to be completely obliterated, and to consist of a small cord coiled upon itself, attached to the colon and without any canal. The mesentery also was fatty.

**Ulceration of the Appendix.**—This condition, though it may follow a catarrh in some cases or be associated with cystic disease, is, as a rule, due to the presence of fæcal concretions arising in the following way: Chronic constipation is frequently found to have been a preceding condition, and there can be no doubt that in health the appendix frequently contains small masses of soft fæces which are extruded as the large bowel empties itself; but when constipation is marked and the cæcum and colon are not thoroughly emptied, small portions of fæcal matter remain in the appendix, and the water they contain being gradually abstracted, they become harder and harder. Coincidentally with this, no doubt, changes occur in the epithelium, and

<sup>1</sup> *Annals of Surgery*, vol. xxvii., p. 319.

<sup>2</sup> *Ibid.*, vol. xxiii., p. 608. Mynter, *op. cit.*, p. 57, quotes the following:

OBLITERATION OF APPENDIX.

			Partial.		Total.
Kelynack	...	98 cases	21	...	2
Hawkins	...	100 bodies	4	...	1
Renvers	...	13 autopsies (all having had previous attacks of appendicitis)	1	...	12



herein lies the whole of their significance. So long as the epithelium remains undamaged these concretions occasion little or no harm, but once the epithelium is destroyed or denuded, absorption takes place, and the tissues begin to break down. At the same time the parts around the concretion are often thinned. Now, disaster may follow in one of two ways: either septic absorption takes place from the ulcerated surface in the neighbourhood of the concretion, or else perforation follows, with the escape of foul muco-pus. As these fæcal masses become harder and harder the central core is often markedly calcareous, and hence they have been mistaken for foreign bodies. Indeed, Hawkins mentions an instance in which the calcareous mass was so hard that it could be made to bound upon the floor of the post-mortem room without breaking. If they are carefully examined, they are found to consist mainly of phosphate and carbonate of lime and carbonate of magnesia coloured by the bile salts. In size they may vary from a barleycorn up to  $\frac{1}{2}$  inch in diameter. Blackadder in 1824 recorded an instance of an earthy concretion the size of a thrush's egg, which he removed from the appendix of a man who died from phthisis, and an interesting point is, that that particular patient had given no history of trouble in the right iliac region.

**Gangrene: Localized and General.**—Clinically, this condition often gives rise to so-called infective appendicitis. Hawkins<sup>1</sup> remarks: 'It will be maintained that an acute inflammation of the tissues of the appendix-wall is a form of appendicular disease which must be recognised as of common occurrence. That this form of appendicitis may result from either the catarrhal or the ulcerative form already described. It may arise independently of either, and is rightly distinguished by the name of infective appendicitis, because it appears to be in all cases associated with, and probably due to, a bacterial invasion of the

<sup>1</sup> *Op. cit.*, p. 39.



tissues of the appendix wall, and because in all cases it leads to a virulent peritonitis, with a poisonous effect upon the patient. Infective appendicitis is the most common cause of acute general peritonitis, and accounts for nearly half the cases of this kind, and is a more potent cause than even a faecal concretion.' Now, it is impossible not to recognise that in these cases of localized gangrene the appendix to the naked eye may seem fairly healthy, and it is only on careful examination of it, by making sections of it in various directions, that the true condition can be appreciated. In all cases there is probably some loss of epithelium, which forms a gateway for the entrance of *Bacillus coli communis* into the deeper structures. The result is that the submucosa and muscular coats become infiltrated with leucocytes. Suppuration may occur in the coats, or even necrosis, without necessarily bursting through the peritoneal coat or into the lumen of the appendix. But slight though they may appear to the naked eye, they are frequently followed by fatal peritonitis.

Hodenpyl<sup>1</sup> found the colon bacillus in the interior of five normal appendices and of fifteen appendices which were inflamed; but to Hawkins must be assigned the credit of clearly showing the connection existing between the presence of *Bacillus coli communis* and gangrenous and infective appendicitis. But if one is questioned as to why at one time the colon bacillus is non-virulent and at another time becomes highly virulent, the answer is still somewhat uncertain. The essential feature seems to be the destruction of the protective epithelium. The denuded patch forms the portal of entrance. Again, it has been clearly shown that the virulence of the colon bacillus depends very much upon the circumstances in which it is placed. I have often been disposed to think that the comma bacillus is not alone the cause of cholera,

<sup>1</sup> *New York Medical Journal*, 1893.



especially as it has been found in drinking water six or eight weeks before the outbreak of cholera, but that its activity is dependent upon varying conditions of the colon bacillus, and that the comma bacillus meets with such a responsive condition or state of the *Bacillus coli communis* that the symptoms of cholera are developed. Something of a similar kind may happen in the case of appendicitis.

The gangrene may be either distinctly localized, in the form of a necrotic patch in the tip of the appendix, with or without perforation,<sup>1</sup> or consist of an intramuscular abscess or of a necrotic patch in the mucosa, or there may be a ring of gangrenous tissue completely around the circumference of the appendix, or, lastly, the whole appendix may be gangrenous and detached, and be found floating about in the pus of an appendicular abscess.

Fowler has pointed out that there is but one arterial supply to the appendix, and he thinks that the explanation of these gangrenous cases may lie in thrombosis of septic

<sup>1</sup> Mynter (*op. cit.*, p. 78), 'Perforation of the Appendix':

Fitz in 61 cases found perforation—

On the 1st day in 41 cases	=	67 per cent.
„ 2nd „ 5 „	=	8 „
„ 3rd „ 12 „	=	20 „
„ 4th „ 2 „	=	3 „
„ 5th „ 1 „	=	2 „

Sudden severe pain occurred in 84 per cent.

#### DIAGNOSIS OF PROBABLE PERFORATION.

Mynter (*op. cit.*, p. 97)—Of 50 patients who had perforation or diffuse peritonitis or gangrene without perforation:

29 gave history of no previous attacks

4	„	„	„	1	„	„
5	„	„	„	2	„	„
6	„	„	„	3	„	„
1	„	„	„	4	„	„
2	„	„	„	many	„	„

About 40 per cent. were therefore chronic recurring cases.

About 20 per cent. had had 3 or more attacks.

Mynter (*op. cit.*, p. 98), 'Diagnosis of Perforation':

Talamon: May be determined by 3rd or 4th day.

Murphy: 50 per cent. of fatal cases die before 6th day.

Many cases die on 4th day. Fewer cases die on 2nd day.



origin in that vessel. But that condition would only account for those cases in which there is gangrene of the whole appendix, and not for those localized patches which are so frequently found. The importance of the true conception of the pathology of this form of appendicitis cannot be overestimated, and it should be firmly grasped that very slight apparent changes in the appendix give rise to peritonitis, and that no appendix can be acquitted on mere naked-eye examination. In doubtful cases it is wiser at once to remove the organ, and it will frequently be found in such cases that septic toxic symptoms subside and the illness reaches a happy termination. Not only is the *Bacillus coli communis* found in these cases, but also *Staphylococcus pyogenes aureus* and *Streptococcus pyogenes aureus* and *Proteus vulgaris*. The interchange of secretions or waste products of these various bacteria seems to be the cause of the excessively toxic symptoms which are sometimes produced. The patient may die of septic poisoning within the first thirty-six hours of the onset of symptoms.

### 3. In their Relation to the Peritoneum.

Practically this remark is true: 'No appendicitis without peritonitis.' The pain and the swelling originate largely from implication of the peritoneum over the site of disease. Now, the forms of peritonitis which are found are three in number: Adhesive peritonitis, localized peritonitis with circumscribed abscess, and general peritonitis. In some cases a localized abscess is associated also with adhesive peritonitis for some distance from the site of the abscess. With regard to the causation of peritonitis, it has been indisputably shown that an escape of the colon bacillus is the immediate and the exciting cause. It is not necessary that there should be a perforation of the appendix, merely such a condition of the epithelium of that structure as will permit the entrance of the colon bacillus into the lymphatic



and deeper structures and thence to the peritoneum. It is also essential for the production of appendicular peritonitis that the virulence of the colon bacillus should be considerably enhanced. It has been shown by Ziegler that if a small quantity of a pure cultivation of the colon bacillus be placed in a peritoneal cavity, a localized peritonitis follows.

**1. Adhesive Peritonitis.**—This condition of the peritoneum is usually found in association with that of a cystic or catarrhal appendix, and the colon bacillus has been found in the exudation, thus clearly showing the connection of adhesive peritonitis with the escape of that bacillus. As a rule, cases of adhesive appendicitis terminate without abscess and without operation. Occasionally, however, the case is prolonged, and an abscess forms. But the chief importance of adhesive peritonitis is that owing to it obstructions of the bowels are formed. Such a case is recorded by Dr. Markoe.<sup>1</sup> The case is as follows: 'Dr. Markoe operated upon a girl some days after a single attack of appendicitis. The symptoms when she was operated upon were those of obstruction with fæcal vomiting. The appendix was found lying directly across from the cæcum towards the left side. Its extreme end had been perforated, and to that a loop of the ileum was bound, which gave the latter a sharp turn directly backwards, interfering with the passage of the intestinal contents. The small but very firm old adhesions were severed, and immediately the loop of intestine filled again. Unfortunately, however, the result was not successful.' But obstruction of the intestines is more common when pus has formed. Many such cases are on record. A case of volvulus is reported by McBurney.<sup>2</sup> The volvulus came on ten days after an operation for appendicitis with gangrene and perforation, and was due to

<sup>1</sup> *Annals of Surgery*, vol. xix., p. 678.

<sup>2</sup> *New York Medical Record*, July 26, 1896.



adhesion of a coil of the ileum, producing a half-twist. The patient subsequently recovered by operation. Mynter<sup>1</sup> also mentions a case of his own of obstruction.

## 2. Circumscribed Abscess (Perityphlitic Abscess).—

The morbid condition of the appendix associated with this form of peritonitis is usually more advanced than in the adhesive form; although an abscess may follow adhesive peritonitis, yet it is usually associated with either a concretion or with ulceration or perforation of the appendix. The abscess is generally peritoneal, and Finkelstein<sup>2</sup> has shown that it may be found in one of four different places: (a) It may lie forward and outward, the cæcum limiting it behind, and the adherent coils of intestines on the inner side. The parietal layer of the peritoneum then forms the anterior margin. (b) Pus may form posteriorly, with the posterior surface of the cæcum limiting it in front. The position of the abscess is dependent, in this case, upon the fact that the appendix lies behind the cæcum. In such cases the pus is apt to track upwards as far as the lower end of the kidney, or even up to the diaphragm. In four cases I have found an abscess that might reasonably be called a perinephritic abscess. Occasionally pus forming posteriorly to the cæcum may track downwards, following the iliac vessels in the same way as an iliac spinal abscess does, and may then open in the neighbourhood of Poupart's ligament, or even in the thigh. (c) The inner surface of the colon and cæcum may form the external wall of an abscess, the mesocolon forming the posterior wall, and the lower and inner wall being formed by masses of adherent intestines. Mynter<sup>3</sup> states that this is the most serious form and most difficult to operate upon without infecting the peritoneal cavity. (d) The pus may pass downwards into the peritoneal cavity,

<sup>1</sup> 'Appendicitis and its Surgical Treatment,' p. 68.

<sup>2</sup> *Deutsche Zeitschrift für Chir.*, 1891, Bd. xxxviii., 211.

<sup>3</sup> 'Appendicitis,' p. 61.



with a mass of omentum and adherent coils forming the upper margin. In females such cases as these may be mistaken for pelvic cellulitis, especially if the abscess should discharge into the bladder, vagina or rectum. The pus has even been met with on the left side, especially in those cases in which the appendix has been found lying across the middle line. Indeed, there is no limit to the possibilities of the tracking of pus from a diseased appendix. I have already mentioned a case in which a diseased appendix was found in a femoral hernia, and such an instance gives point to the remark as to the extraordinary places in which appendicular abscesses may point.

The size of these abscesses varies considerably, from a few drops of pus to 1 or 2 quarts. As a rule, the size of the abscess is dependent upon the duration of the disease. But the size of the swelling as felt externally is no definite guide to the amount of pus present. Much of the swelling is undoubtedly due to thickening of the peritoneum, and to the mass of agglutinated intestines and attached omentum. In many cases in which there is a large amount of swelling present, pus is very difficult to find, and it is sometimes pent up in a thin layer between adherent coils of intestines. Gas is also found occasionally in the abscess, and this condition is usually associated with a perforated appendix. But it may also be due to decomposition in the pus without perforation of the appendix. Rarely has fæcal matter been found in an abscess. The veins in the neighbourhood may be blocked by septic thrombosis, and pylephlebitis may result, which may give rise to multiple septic abscesses of the liver.

**The Contents of an Abscess.**—The character of the pus present varies very largely indeed. Occasionally it is of the description which is described as 'pus laudabile.' But more often it is brownish or greenish in colour, with an offensive or fæcal odour. Sometimes it is of a dirty colour



and thin. In the place of pus there may be found a scanty thin greenish liquid with a very evil odour. Such cases as these are apt to be particularly septic. Treves<sup>1</sup> says: 'In chronic cases a yellowish-white, soft, custard-like material is sometimes produced, which is often met with in operations upon the appendix during a quiescent period. I believe it to be neither changed pus nor a residuum left by pus. In some cases I have scraped away a teaspoonful of this matter from the appendix and its neighbourhood.' This condition I have seen once in the case of a little girl, aged ten, from whom a considerable quantity, amounting to an ounce or more, of this cheesy material was removed. When an abscess is opened, the appendix may or may not be seen. If it does not come readily into view, I am of opinion that no prolonged search for it should be made. Rarely it has been found gangrenous and detached, and Paget has described a case in which it floated out when the pus was evacuated. The appendix has been found perforated, containing a faecal concretion, or perforated and empty. But as often as not no visible lesion is present on the exterior of the appendix, which merely feels somewhat thickened and irregular, and is probably somewhat kinked. A perityphlitic abscess, at first always intraperitoneal, may, if left, make its way out and become extraperitoneal, and may then track in all manner of directions. I remember well being called to see a woman, aged forty, who had a sinus at the lower part of Scarpa's triangle, from which ichorous pus was exuding. The medical attendant had not suspected appendicitis. But on examination a thickening was readily discovered due to that cause. The sinus was opened up, and the origin of the purulent discharge clearly traced to the appendix. Pus in connection with actinomycosis of the appendix will be alluded to presently.

### 3. General Peritonitis.—There may with due reason

<sup>1</sup> 'Perityphlitis,' p. 16.



be said to be two forms of general peritonitis: primary and secondary. By the primary is meant diffuse general peritonitis, due to perforation or gangrene of the appendix. By the secondary is meant the bursting of a localized abscess into the general peritoneal cavity. The degree of peritonitis necessarily depends upon the amount and virulence of the morbid material introduced into the peritoneum. The infection of the peritoneal cavity is greater when the appendix is gangrenous, or when it exhibits a large perforation. The effusion produced may be scanty or copious, it may be serous or sero-fibrinous, or sero-purulent, or purulent. In some cases it is entirely free from odour. In others it reeks strongly of fæces. Mikulicz<sup>1</sup> remarks: 'Special forms of appendicitis are the acute septic peritonitis without exudation, and with slight injection of the apparently normal peritoneum, the subacute peritonitis with dry fibrous adhesions, but also without exudation, and a diffuse peritonitis with sero-purulent exudation. Fenger<sup>2</sup> considers the dry forms absolutely fatal. There is also another form of sero-purulent appendicitis in which the intestines become matted together, and a large number of small abscesses are formed between them. The intestines in cases of peritoneal infection are found matted together by adhesions and false membranes with layers of pus between them, and there is present in them a variable quantity of abnormal effusion with the characters above mentioned. Clinically we find that many cases at the first onset of the disease show signs of acute peritonitis, but in a large number of cases the acute symptoms subside, leaving a localized peritonitis, and the usual perityphlitic swelling in the right iliac fossa.

**Actinomycosis.**—Cases of actinomycosis of the appendix and cæcum have been described. Messrs. Makins and

<sup>1</sup> *Archiv. für Klin. Chirurg.*, 1899, Band xxxix., p. 756.

<sup>2</sup> *Amer. Journ. of Obstet.*, 1893, vol. xxviii., No. 2, p. 15.



Abbott describe such an one in the St. Thomas's Hospital Reports. Beyond complicating the diagnosis and the treatment, such cases are not of any great interest. They are essentially chronic in nature, and exceedingly difficult to bring to a successful result. New growths in the appendix arising primarily in that situation are also rare, but a new growth in the cæcum is not so uncommon. As a rule its hardness, the nature of the history, and the age of the patient will assist in the diagnosis. I remember such a case coming before my notice at the Westminster Hospital, in which a man, aged fifty-six, had a large carcinomatous growth in the cæcum. The clinical characters were clear, but, unfortunately, the mesenteric glands were involved, and the case beyond the reach of surgery.

### The Bacteriology of Appendicitis.

A careful and critical chapter on this subject under the title of 'The Actual Causation of Peritonitis in Appendicitis' is given by H. P. Hawkins in his able writings on the subject. He there shows conclusively, as I think, that the main factor is the *Bacillus coli communis*, and supports his statement by reference to the work of numerous surgeons and bacteriologists. And he sums up the matter thus: 'In sixty-one cases of general peritonitis or perityphlitic abscess consequent on disease of the appendix, the colon bacillus was found in the exudate of fifty-seven, and in fifty of these it was the only microbe present.' At the same time it must be remembered that in some cases pyogenic cocci are found both inside the appendix and in the exudate around it. Bodenfeld found streptococci in one case, Welch in one case, Tavel and Lanz in several cases, and *Micrococcus pneumoniae* in two cases, and in one case *Staphylococcus pyogenes aureus* was the only form present; so that it is possible in some cases a pyogenic coccus may be the agent which excites peritoneal inflammation. As to



whether the colon bacillus is the actual cause of the adhesive inflammation in less severe cases some doubt is expressed, but the fact that pure cultures of the colon bacillus have been obtained from the exudation seems to point strongly to the conclusion that that bacillus is the prime cause. But, as Hawkins puts it, 'its virulence when introduced into the peritoneum is dependent to some extent on the fluid with which it is mixed, and this is an important point when we consider the wide variation of the clinical forms of appendicular peritonitis.' That is to say, that so long as the appendix is healthy the *Bacillus coli communis* is benign. But once the state of the fluid in the appendix is altered, such an alteration is conducive to an acquired malignancy on the part of the bacillus. This bacillus has been found also in abscess of the liver following appendicitis, and a pure cultivation has been obtained in two cases of suppuration of the gall-bladder. So that, to sum up, we may conclude that the main cause is the altered activity of the colon bacillus, and in some cases this colon bacillus is found to exist alone in the peritoneal cavity, in other cases to be associated with various cocci which seem to increase its virulence.

#### CHAPTER IV.

### ETIOLOGY AND SYMPTOMS OF APPENDICITIS.

**Age.**—Appendicitis is a disease of young life. A large proportion of cases occur between the tenth and twentieth years. Of 50 cases collected from the records of Westminster Hospital, there were 8 cases under the age of 10 years, 24 between 10 and 20, 11 between 21 and 30, 3 between 30 and 40, 1 between 40 and 50, and 3 between 50 and 60. And Hawkins found that of 224 cases in



St. Thomas's Hospital, 11 per cent. occurred from the fifth to the tenth years, 43 per cent. from the tenth to the twentieth, 33 per cent. from the twentieth to the thirtieth, 8 per cent. from the thirtieth to the fortieth, 6 per cent. from the fortieth to the fiftieth, and nine-tenths per cent. over 50 years of age, so that the disease is prone to fall upon people at the time that the secreting activity of the intestine is greatest, and at the time when the lymphoid structure is most in evidence.

**Sex.**—Roughly it may be said that it is four times as common in the male as in the female sex. The reason for this is rather difficult to speak of with certainty. Anatomically it is stated that whereas in the male the appendix has only one arterial supply, in the female sex a second artery runs to the appendix through the peritoneum, and comes from the right ovary. In adult life males are more subject to causes such as hasty eating and neglect of themselves in more ways than are females.

**Season of the Year.**—Treves states that hospital statistics show that attacks of this disease are more common in the summer than in the winter. More especially is this the case in tropical than in temperate climates.

**Influence of Injury Producing the Disease.**—A large number of cases are recorded in which inflammation has followed on an injury to the right iliac region or a strain. It is probable that in such cases as these the appendix was either in a cystic or a chronically inflamed condition, and the effect of the blow or a strain was merely to light up trouble which was already latent.<sup>1</sup>

<sup>1</sup> Mynter, *op. cit.* (p. 48):

TRAUMATISM.				
Fitz	...	of 257 cases	...	19 times
Hawkins	...	of 190 "	...	16 "
Mynter	...	of 75 "	...	4 "
		522 "		39 "
Average $7\frac{1}{2}$ per cent.				



**Foreign Bodies.**<sup>1</sup>—At one time it was considered that foreign bodies were largely responsible for appendicitis, but it has now been shown that they are so only in a small proportion of cases. Pins have been found in perityphlitic abscesses, having escaped from the appendix. There is no doubt the extraordinary shapes assumed by fæcal concretions gave origin to the idea that foreign bodies were commonly the cause of appendicitis. Such fæcal concretions are sometimes oat-shaped or awn-shaped, and some bear a close resemblance to the stones of fruit. It is highly probable they are formed in the appendix itself, being composed of the salts of the fæces and the salts in the appendicular secretion. In fact, many of the so-called foreign bodies are fæcal concretions.

**The Condition of the Digestive Apparatus.**—It is quite clear that in almost all cases of appendicitis there has been a previous history of indigestion, constipation, or chronic diarrhœa. The excessive prevalence of appendicitis in America may be explained by the habit of eating food very rapidly with insufficient mastication, and the fact that iced water and nuts are often freely partaken of. Treves notes that commercial travellers are particularly apt to suffer from the affection on account of the irregularity of their meals, and the hasty way in which they are compelled to eat them. It is quite certain that in many cases an attack of appendicitis immediately follows the ingestion of some unusual and ill-suited article of diet.<sup>2</sup> A dish of lobster, cold veal pie, ducks, pineapple, haricot beans, salad, are all liable to bring on an attack in a person so pre-

<sup>1</sup> Mynter, *op. cit.* (p. 38):

	Cases.	Coprolites.	Foreign bodies.
Renvers ...	459 autopsies	... 39 per cent.	... 3½ per cent.
Fitz ...	132	... 47 "	... —
Maurin ...	60	... 56 "	... —
Krafft ...	106	... 34 "	... 4 per cent.
Murphy ...	141 operations	... 30 "	... 3½ "
Mynter ...	75 "	... 35 "	... 1½ "

<sup>2</sup> Cf. Hawkins: in 190 cases, 12 times.



disposed. There can also be no doubt that defective teeth take a share in the production of the disease.

### Symptoms.

It may be well to enumerate the symptoms common to all forms of the disease, and then to assign to them so far as possible their significance and value in dealing with the clinical aspects of the disease.

**Premonitory Symptoms.**—In nearly all cases before the attack commences, there are certain warnings which take the form of more or less acute gastro-intestinal disturbance with colicky pains, at first general and then localized in the right iliac fossa, intermittent diarrhoea and constipation, distressing flatulence, the expulsion of foetid flatus or of an evil-smelling motion. Nausea is often present, and the patient complains of malaise. So well marked are these premonitory signs, that in recurrent cases the patient is often able to foretell the advent of a further attack. It is possible that this gastro-intestinal disturbance is due to absorption of the toxic products of the *Bacillus coli communis*, which has acquired an unusual virulence. After a few hours or days of these premonitory symptoms, the disease commences suddenly, often in the early morning. Especially is this so in recurrent cases. Indeed, some recurrent attacks in individuals have been noted to occur at about the same time of day on each occasion. In some cases, as before mentioned, direct violence appears to develop the acute symptoms.

**Pain.**—A sudden and severe pain in the abdomen is in nearly every case the first symptom. Its character varies. Some patients describe it as cramp-like, others as burning, tearing or aching. Often it is so intense that words fail to describe it, and it is accompanied by some collapse, like that seen in renal or biliary colic. Pressure does not relieve,



but aggravates it. Its situation is, during the first twenty-four to thirty-six hours, all over the abdomen, but afterwards it becomes localized in the right iliac fossa. In rare instances the pain is worse on the second day on the left side of the abdomen, and when this has been observed it has been found on operating that the appendix lies across the spine, with its tip pointing to the left. The causation of the pain, when it is excessively acute and accompanied by collapse, is probably rupture of a cystic appendix or the escape of a purulent collection or of a faecal concretion.

The explanation of the general distribution of the pain in the earlier part of the attack is somewhat difficult, unless the disease be one of general peritonitis from the first. Treves,<sup>1</sup> however, notices that it corresponds with the distribution of the superior mesenteric plexus. Mynter<sup>2</sup> thinks it to be dependent upon direct irritation of the appendix. Fowler<sup>3</sup> observes that he saw the same umbilical pain, when he compressed the bowel with a Dupuytren's enterotome in the treatment of a case of artificial anus. Bacon<sup>4</sup> compressed the appendix with an artery forceps previously to amputating it under local anæsthesia, and observed the patient to complain of severe umbilical pain.

If micturition be accompanied by pain, the appendix is probably dependent in the pelvis and the dysuria is due to inflammation of the peritoneal surface of the bladder. In three cases of my own, I have verified this fact by subsequent operation; and in one very interesting case of a woman, aged forty-five, who had had several attacks and was never free from pain, even in the intervals of the acute symptoms, I found the tip of the appendix adherent to the right side of the uterus at its junction with the right Fallopian tube.<sup>5</sup> When pain is felt down the front of the

<sup>1</sup> 'Perityphlitis,' p. 24.

<sup>2</sup> 'Appendicitis and its Surgical Treatment,' p. 78.

<sup>3</sup> *Annals of Surgery*, February, 1894, p. 148.

<sup>4</sup> Quoted by Mynter, *op. supra cit.*, p. 78.

<sup>5</sup> Cf. a very instructive paper on 'Appendicitis in Girls and Women,' by J. Bland Sutton—*Clinical Journal*, March 14, 1900.



thigh, its distribution may be due to implication of peritoneum covering the psoas muscle.

As a rule, the pain becomes less on the third day if the patient be kept at rest, and can then be controlled by opium. Purgatives aggravate it, especially during the first two days, and this is often the least harmful consequence of giving an untimely purgative. It may be added that the greater the pain and the longer it persists, the more probability there is that perforation or gangrene has occurred. Occasionally the pain may diminish, and even disappear,<sup>1</sup> only to return when symptoms of suppuration declare themselves. The

<sup>1</sup> At the discussion recently held on the subject of appendicitis at the Academy of Medicine, M. Dieulafoy read a paper, of which the following conclusions are the pith: 1. The acute symptoms of appendicitis—the abdominal pain, the vomiting and the pyrexia—are sometimes followed by a marked remission, the pain disappearing, the temperature falling, and the patient feeling much better. 2. This remission and defervescence are not always significant of a real improvement in the condition; sometimes they mark a false remission, a deceitful and treacherous calm. 3. It is important to note that this deceptive calm often coincides with the occurrence of grave lesions—such as gangrene of the appendix, septic infection of the peritoneum and diffuse peritonitis. 4. The remissions are never complete, for if the case be closely observed, it will be seen that the course of events differs from a real improvement by the persistence of some of the symptoms. Thus, the abdomen remains tympanitic, the muscular rigidity continues, and the quick pulse-rate persists although the temperature falls. Urobilinuria and albuminuria are by no means uncommon. 5. Such deceptive remissions are sometimes brought about by drugs, especially by the use of morphia or the application of ice-bags, which mask the onset of danger-signal symptoms. 6. This deceptive remission supervenes at various times from as early as the second day to as late as the fourth or sixth day. 7. Such remissions, coinciding as they do with the onset of the gravest peritoneal lesions, show once more the inaccuracy of drawing a sharply defined line between the condition of appendicitis and that of peritonitis. Such views give rise to the most serious errors, for the symptoms of appendicitis and peritonitis are very similar—are, in fact, so interwoven and bound up together that it is impossible to say at what particular moment peritonitis commences. 8. These deceptive remissions are the most potent cause of death from appendicitis. A temporizing physician or surgeon seizes upon one of these intervals of calm as a reason for putting off surgical interference. Soon, however, some terrible complication supervenes against which surgery is powerless, and the patient dies. 9. It is of the first importance to distrust these treacherous calms, to remember their existence, and to operate without delay if it be desired to save the patient from death.



pain of which the patient complains is a subjective symptom, and must be clearly distinguished from tenderness to pressure, which is an objective sign.

**Vomiting.**—Nausea is commonly present, and vomiting is frequently seen in the first few hours of the attack. Indeed, the patient may first vomit and then suddenly be seized by pain. Especially is this so in the case of children. In the adhesive forms of appendicitis, so soon as the stomach is emptied vomiting ceases, unless the patient be intolerant of opium or morphia. If vomiting persist in the absence of these drugs, it may be surmised that a large extent of peritoneum is implicated, and when it is extremely pronounced it is associated with early formation of pus. If the vomit be offensive or stercoral, it is an indication of general peritonitis, which is almost invariably fatal. On the other hand, in this last class of case vomiting is sometimes trifling or absent, and although fluids may be taken for the relief of thirst, they are ejected as soon as swallowed. In recurrent attacks the vomiting is less with each succeeding attack.

**Constipation.**—This is almost always present from the first. It is due to paralysis of a portion of the bowel. If the constipation persist for many days, obstruction of the bowel should be feared. Such obstruction may be due to kinking or the formation of bands from the adhesions. In place of constipation diarrhoea is sometimes seen, and vomiting is but little marked; and Hawkins<sup>1</sup> thinks that when the initial pain and vomiting are accompanied by two or three actions of the bowels, general rather than local peritonitis is present.

**Temperature and Pulse.**—Soon after the onset of the pain it is found that the temperature is rising, and within a few hours it varies between 102° and 104° F. If the attack be of the mildest description, the temperature falls to normal in two or three days' time. If not quite so mild, the tempera-

<sup>1</sup> *Annals of Surgery*, p. 78.



ture remains at  $103^{\circ}$  to  $104^{\circ}$  for three or four days, and then falls gradually with evening rises and morning remissions. Unfortunately, all cases are not so simple as these. In very severe cases the temperature may be subnormal if taken externally. It is, however, always valuable in such an event to take the temperature per rectum, when it will probably be found raised somewhat. In some instances, Hawkins<sup>1</sup> remarks, 'a steady rise in temperature sets in during the course of illness strongly suggestive of the formation of pus, and yet the illness may be as uneventful as usual. Indeed, the maximum point may be reached just before the peaceful end of the illness in resolution.' He quotes a case in point. But the temperature may be taken as a guide to the formation of pus. If after the first acute rise of temperature there be a fall, and if it be succeeded by a further and prolonged rise in temperature, pus should be suspected, especially if such a rise occur about the sixth day onward. Occasionally the fever subsides by crisis, so to speak, and this may be due to the sudden discharge of some pus into the bowel cavity. The disappearance of the mass in the groin is by no means coincident with a fall of temperature, and, indeed, one would not expect it to be the case necessarily, since the greater part is composed of inflammatory non-purulent effusion into the subperitoneal tissues. A subnormal temperature is, as before said, indicative of general peritonitis. More especially should this be regarded with suspicion if the pulse be very rapid. A combination of subnormal temperature and rapid pulse over 100 would lead one to suspect that perforation or sloughing of the appendix had occurred, and that diffuse peritonitis was not far off. Willy Meyer<sup>2</sup> says 'if the pulse with all the symptoms well developed has a tendency to go above 116 or 118, still more if it goes up to 120 or higher,

<sup>1</sup> 'Diseases of Vermiform Appendix,' p. 80.

<sup>2</sup> *New York Medical Record*, February 29, 1896.



and *stays there*,<sup>1</sup> we should operate at once. If this happens with low temperature operation is still more urgent.' Rigors may be associated with a rise of temperature, and may be symptomatic of the formation of pus. Treves<sup>2</sup> says 'the range of temperature observed in the cases attended with loose or regular action of the bowels would appear to be lower.'

The **respiration** should be noted. As a rule, it rises with the pulse. Should the respiration be simply costal, especially in males, it is indicative of diffuse peritonitis, but it may also occur to a moderate degree in necrotic forms without perforation. It is indicative, so to speak, of the general loss of function of the peritoneum due to septic absorption, and if there be meteorism also present the outlook is grave.

### Physical Examination of the Abdomen.

**Rigidity.**—According to the stage and degree of the illness, the abdomen will be found either rigid or somewhat distended or tympanitic. At first there is a general rigidity of all the abdominal muscles, but in a day or two this passes off, and the abdomen becomes distended to a variable degree. Later the rigidity becomes localized in the right iliac fossa, and remains so if a limited peritonitis be present. The muscles are locally in a defensive state. But rigidity often persists on both sides as a preceding condition to meteorism if the peritonitis is diffuse and arising from the perforation of a gangrenous appendix or of a local abscess. Rigidity is absent in very early cases, or those in which the appendix is lying in the pelvis, and in some of the cases in which it is behind the cæcum. As before said, the rigidity passes off, and then a tumour may be felt in the right iliac fossa. In some acute cases rigidity persists, so that no tumour can be made out.

**Tenderness.**—This is never absent, and is found

<sup>1</sup> The italics are the author's.

<sup>2</sup> 'Perityphlitis,' p. 76.



throughout the whole course of illness. It is best marked in the right iliac fossa, and is either diffuse or localized. When diffuse it has been known to extend up to the right costal margin and into the flank. It is best marked at a spot known as 'McBurney's point,'<sup>1</sup> situated at the mid-point of a line drawn from the right anterior superior spine of the ilium to the umbilicus. This point corresponds roughly with the origin of the cæcum from the appendix, and tenderness on deep pressure will generally elicit pain, even after the fever and other symptoms have disappeared. Mynter<sup>2</sup> notes that 'tenderness at this spot is absent if the appendix is totally gangrenous, or if there is a long appendix extending down into the pelvis and inflamed at the tip, while the part near the cæcum is healthy. In such cases the most severe pains will be elicited by rectal or vaginal examination.' McBurney regards his sign as diagnostic of appendicitis, but it is also present when the ovary or the right uterine appendages are inflamed and the appendix is healthy. In males, therefore, its presence is of greater significance than in females. It is not so marked in cases of general peritonitis. The amount of tenderness, however, is by no means a measure of the extent of inflammatory trouble present. In diffuse peritonitis it may be entirely absent, and Treves<sup>3</sup> mentions two cases of septic peritonitis due to appendicular trouble, which ran their entire course with a soft abdominal wall, and with little or no tenderness. Both patients were men over fifty, who had not had any morphia, and in both cases death took place in seven days. One man spent some hours in applying massage to his own abdomen, and the other drew frequent attention to the absence of tenderness by slapping his abdominal wall.

<sup>1</sup> *New York Medical Journal*, December 21, 1889, p. 678; *Annals of Surgery*, April, 1891, p. 236.

<sup>2</sup> *Op. cit.*, p. 79.

<sup>3</sup> *Op. cit.*, p. 27.



**Tumour.**—As the rigidity passes off on the second or third day, a swelling may be felt in the right iliac fossa of variable size and shape, but the tumour usually coincides with an area dull to percussion. It may be triangular in shape, with its base about the anterior superior spine and the outer part of Poupart's ligament, and its apex towards the umbilicus; or it may be quadrilateral in shape, or sausage-like or circular. Its consistency varies, but it is hard rather than soft. Fluctuation cannot, as a rule, be detected in it. In size it may range from that of a hen's egg to a mass reaching to the umbilicus, or across the middle line on the other, and up to the costal margin and back into the flank on the same side. If the appendix lies in the pelvis, there may be no tumour to be felt through the abdominal wall, but in such cases as these and in children digital examination of the rectum reveals the presence of an abnormal mass. It is composed as follows: Congested and oedematous walls of the cæcum and small intestines in this region, coagulated fibrous exudation between inflamed intestinal walls, thickening and adhesion of the omentum, thickened subperitoneal tissue, and occasionally hardened fæces in the cæcum. As the disease subsides the tumour disappears.

**Percussion.**—In the early stages there may be a tympanitic note over the whole abdomen, or it may be only partial. It, however, persists and becomes general if diffuse peritonitis sets in, or it may occur without the latter being present if obstruction from bands has occurred, or if obstinate constipation from opium has been induced. The percussion note over the tumour is, as a rule, impaired, but it may be tympanitic if the effusion be situated deep down in the iliac fossa. In most cases, however, there is varying dulness over an area corresponding with the iliac swelling, although the dulness is patchy on account of the intestines which compose a part of the swelling, and occasionally



peristaltic movements may be noticed within the area of dulness. Too much reliance must not be placed upon either tympanites or dulness, but in the male more or less acute tenderness in the right iliac fossa, together with the general symptoms of illness, will afford a safe ground for diagnosis. The veins in the right iliac region are often well marked. This is due to obstruction in the deeper parts.

**General Symptoms.**—At the onset the patient's face is indicative of the pain he is suffering, and later on it assumes a peritonitic aspect, which becomes more pronounced should diffuse infection be present. The tongue is more or less dirty, and if the case be severe it becomes dry. When severe peritonitis is present there is considerable thirst. If the illness is prolonged the patient becomes wasted, probably due to the fever. Some patients lie on their backs with their knees drawn up, and contraction of the ilio-psoas muscle is occasionally present. The pulse is that of fever except in the latter stages of acute general peritonitis.

The urine is febrile, and in severe septic cases contains some albumen. Occasionally indican is found in it. Purdy<sup>1</sup> believes this to be due to excessive decomposition of protoplasm by septic products.

**Leucocytosis.**—Polynuclear leucocytes are found in the blood when pus is present, according to Mynter, and he regards it as a sign of diagnostic value, since, according to him, there is no leucocytosis in enteric fever.

After the general review of the symptoms given above, it is advisable to give a brief clinical description of the more typical attacks of appendicitis:

**1. Simple Catarrhal Appendicitis.**—This is the mildest form, and in it there is no marked degree of

<sup>1</sup> 'Practical Uroanalysis and Urinary Diagnosis,' Philadelphia, 1895, p. 44.



constitutional disturbance. The temperature may rise to  $100^{\circ}$ , the pulse be quickened, some constipation or, more often, diarrhoea is present, tenderness is noticeable over the right iliac fossa, but the attack ends in resolution in two or three days. The temperature falls gradually until, on about the fourth day, it is normal. Such attacks as these are liable to be repeated sometimes in a more severe form, and may be only a prelude to the severe conditions which are associated with acute peritonitis, so that during the illness precautions must be taken.

**2. Appendicitis with Adhesive Inflammation of the Peritoneum, ending in Resolution** (*i.e.*, the ordinary form of appendicitis).—The description of the symptoms of the first named applies very largely, except where it is otherwise stated, to this form. The illness lasts from six to twelve days; the symptoms steadily diminish in severity from first to last; the lump which forms on the second or third day gradually clears up, and with its disappearance most of the tenderness goes also, and, beyond a little residual tenderness and occasional attacks of constipation, there is not much to remind the patient of the illness through which he has passed. But if he should err in his diet, the previous attack is quickly brought to remembrance by another, which may be similar or more severe than the first one. Such further attacks are known as recurrent appendicitis. Occasionally the disease does not follow this typical course. The temperature may not fall about the second day, the lump may remain persistent up to the twelfth day, or even longer, and pus may be suspected. But such cases as these often clear up without the presence of pus being demonstrated, although it is quite possible that some matter—a few drops at the most—is concealed between the coils of intestines, and this discharges itself into the bowel. It is on this hypothesis that one is able to explain cases of per-



sistent illness—that is, beyond the tenth day—in which the symptoms suddenly clear up by a sort of crisis.

**3. Appendicitis with the Formation of a Local Circumscribed Abscess.**—The conditions associated with the formation of a perityphlitic abscess have been already mentioned. Rarely it supervenes on a simple catarrh of the appendix, but frequently it is due either to ulceration in the appendix caused by a concretion, or acute necrosis of the wall secondary to chronic catarrh. Sometimes a cyst bursts, and, discharging foul matter into the neighbouring peritoneum, a localized abscess is formed. The reason of an abscess forming in one case and of acute peritonitis coming on in another is not altogether clear, but there can be no doubt that the following factors enter into the matter: Firstly, the nature of the discharge into the peritoneal cavity; secondly, its amount; and thirdly, as to whether purgatives are or are not given.

The events which precede a perityphlitic abscess—that is, so far as apparent causation is concerned—are very similar to those preceding a non-suppurative attack; an indigestible meal, a blow, a sudden effort, are all points noticeable in the history of both kinds of attacks. In some cases of abscess there is a previous history of a non-suppurative peritonitis, so that as regards the onset of symptoms, there is nothing at first by which we can distinguish whether an attack is to end in resolution or in suppuration, and, indeed, in the first forty-eight hours it is impossible for anyone to do so; but, naturally, it is of the utmost importance to detect the presence of pus directly it has formed. In this particular the presence or absence of rigors does not help us, since rigors are strikingly absent even when a large quantity of pus is present in the cæcal region. Nor do the abdominal signs at all assist us, as in both the adhesive and suppurative form they are nearly in all cases very much the same. There is no doubt that, if looseness of the bowels and



vomiting be more marked in the early stages, abscess is found more often than in cases not presenting these features. For the following points we are indebted to Dr. Hawkins,<sup>1</sup> than whom nobody has paid greater attention to this subject in all its details. He says: 'In a great majority of these cases of perityphlitic abscess we must rest our diagnosis of the presence of pus entirely upon a continuance or increase of symptoms, not upon any specific difference of the symptoms of the two forms of the disease, the suppurative and non-suppurative.' Suspicions of the presence of pus should always arise if the symptoms do not subside after the sixth day, and still more so when there has been a partial and not an entire subsidence of the symptoms, followed by a sudden increase, between the seventh and tenth days. Hawkins says that 'the larger the tumour is, the greater is the probability of suppuration. The speed with which it is developed is also an important point to notice. Thus, cases which have a large hard mass on the third day should be regarded with great suspicion. Again, an inflammatory mass that remains stationary about the seventh or tenth day generally breaks down into pus. Cases which present the following points in the temperature charts are also suspicious. If there be a partial fall between the sixth or twelfth day, followed by a sudden rise of temperature, also if the temperature show no tendency to fall at all, it would be justifiable to operate for pus.' The general condition is also of service. If the patient remain ill, with a furred tongue, an anxious look, a leg drawn up, and his general condition that of prostration, then, taking all the points into consideration, one may suspect pus. Of course, in appendicitis one does not wait to obtain fluctuation through the abdominal wall, but if any doubt should exist it should be searched for under an anæsthetic. In children it may be possible to detect it by digital examination *per rectum* quite early in the disease.

<sup>1</sup> *Op. cit.*, p. 86.



Although pus does not form, as a rule, until after the fifth or the sixth day, cases are on record in which it was found on the third day; it may, therefore, be present almost from the first. As exceptions to the above remarks, it may be noted that pus may be present without any fever. Again, the temperature may remain high for one to two weeks, and yet no pus is present. An indurated mass of very great size may also exist, and yet the case completely clears up. If the appendix should hang down in the pelvis, the pus will be situated there, and so no abdominal swelling is manifest. Should decomposition take place in the pus, gas will be present in the abscess cavity, and the note over the abscess will be resonant. Again, the persistence of the high temperature may be due to abscess in the liver, or pylephlebitis, or to other complications of appendicitis to be alluded to presently.

There is always a danger that, when an abscess is present, the limiting wall of it may burst, and sudden infection of the peritoneal cavity may occur. But experience shows that, so long as the patient is at rest, there is comparatively little risk of this occurring, because by the very presence of pus and inflammation fresh adhesions are formed, and thus the abscess is more and more walled in. But it is not safe to trust to this. Once an abscess is suspected it must be at once opened, and the right place to do this will be discussed under treatment. When the abscess is once opened and efficiently drained, the wound heals in three or four weeks. It should not be allowed to close too soon; otherwise some pus may be pent up in the numerous pockets in the cavity, and Treves remarks that 'the so-called relapses, if occurring at an early period, are due to the too speedy closing of the skin incision and the resulting accumulation of matter. If the abscess reappear after an interval of weeks or months, it must rank as a residual abscess—that is, as a suppurative process—in or about the residues or remains of an old



abscess.' But, as a rule, the formation of pus cures the patient. There are, however, several cases on record in which further attacks of appendicitis have followed a former suppurative attack.

**4. General Peritonitis.**—This is usually the result either of a necrotic perforation of the appendix or gangrene of the whole structure. It is also due to the giving way of a dilated appendix behind a stricture. In such cases the onset does not, as a rule, differ markedly from what may be described as an attack of medium severity. It is not possible to tell within the first day or two what form the disease may take. When the disease has declared itself, there is sudden tenderness over the whole abdomen, which, according to Hawkins, is never in any way localized in the right iliac fossa. The abdomen soon loses its respiratory movements, and then follows the general clinical picture of acute peritonitis.

**5. Recurrent Appendicitis.**<sup>1</sup>—Some writers make a distinction between recurrent and relapsing or chronic

<sup>1</sup> Mynter (*op. cit.*, p. 74):

#### RECURRENT APPENDICITIS.

	Cases.	Recurrence.	Percentage.
Fitz ...	257	28	11
Krafft ...	106	24	22
Hawkins ...	250	59	23 $\frac{6}{10}$
Mynter ...	75	35	47
	688	146	Average 21 $\frac{1}{4}$

#### SECOND ATTACK: ALBERT WOOD (326 CASES).

	Cases.
Before $\frac{1}{2}$ year ...	210
$\frac{1}{2}$ year to 1 year ...	60
1 year to 1 $\frac{1}{2}$ years ...	14
1 $\frac{1}{2}$ years to 2 years ...	15
2 " " 3 " ...	11
3 " " 4 " ...	3
After 5 years ...	13
	326



appendicitis. By recurrent it is generally understood that in the intervals between the attacks the patient is to all appearances perfectly well. By relapsing or chronic appendicitis it is meant that the patient never completely regains health, but is more or less subject to pain and tenderness, and is confined to his bed or his room. After a patient has once had an attack of appendicitis, it is extremely probable that he will have a second or more attacks, unless during the first attack the appendix has been obliterated or destroyed, or has been removed by the surgeon.

The probability of such attacks recurring has been estimated variously. Hawkins thinks that in about 23·6 per cent. of cases more than one attack occurs. Fitz thinks that 44 per cent. is about the right figure, and with this Treves agrees. In the fifty cases which were collected from Westminster Hospital, the results are given below.<sup>1</sup>

A recurrent attack differs in no respect from any other form of appendicitis. That is to say, an attack, which has been of the adhesive description previously, may assume the purulent form, which may be either localized or general. But as each successive attack occurs in an individual patient, there can be no doubt that there is less rather than more tendency to the formation of pus, and still less likelihood of acute general peritonitis. But in these cases one must consider the question, not only of danger, but also the amount of discomfort, and loss of time, and the worry caused to the patient. Still, one must always bear in mind that although such instances are the rule, yet in recurrent appendicitis acute perforation, or formation of a large abscess, or acute diffuse peritonitis does occur. In the intervals of attacks the patient sometimes complains of more or less constitutional disturbance, of a feeling of tenderness or pain<sup>2</sup>

<sup>1</sup> The first attack occurred in 38 cases, the second in 7, the third in 2, the fourth in 2, and the fifth in 1.

<sup>2</sup> Cf. B. Robinson (*Annals of Surgery*, vol. xxiv., p. 713). What causes the pain in certain cases of chronic appendicitis? In 230 autopsies of



in the ileo-cæcal region, so that he becomes extremely apprehensive, and, in fact, his enjoyment of life is more or less destroyed by his abnormal appendix. He zealously watches and exaggerates every small symptom. A patient will frequently inquire whether it is likely that he or she will have another attack; in answering which question Edebohls'<sup>1</sup> method of palpation assists us materially. Now, Edebohls maintains that it is quite possible to palpate an appendix when normal, and still more so when stiff and swollen. It is done as follows: The patient lies on his back, with the limbs flexed at the hips. The surgeon places three or four fingers of the right hand flat on the abdomen, and feels for the margin of the right rectus muscle at a spot between the umbilicus and the anterior superior spine of the ilium. He introduces his fingers with a light, steady pressure under the margin of the rectus until the pulsation of the common iliac artery is felt. The appendix can now be distinguished just outside the artery, its insertion about an inch distant, while its tip often crosses the artery. The surgeon now moves his fingers slowly outward as soon as the pulsation of the artery is felt, and notes with care the condition of the posterior abdominal wall, *i.e.*, of the ilio-psoas muscle covered with the iliac fascia. Against this fascia the appendix can be compressed.

Mynter<sup>2</sup> says: 'I have, as a rule, found it advantageous

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the abdomen the author took careful record of conditions existing in the region of the cæco-appendix. He finds: Chronic peritonitis existed round the ileo-appendicular apparatus in over 70 per cent. of adults. The chronic peritonitis manifested itself by bands, adhesions or exudates. When the appendix, cæcum, and lower end of the ileum lie in contact with the long range of action of the psoas muscle, they are liable to have adhesions to it. The action of muscles playing on the bowel at times when it contains virulent pathogenic microbes induces the microbes or their products to migrate through the mucosa, muscularis and serosa, causing a serous plastic exudate.

<sup>1</sup> 'Diagnostic Palpation of the Appendix Vermiformis' (*American Journal of Medical Sciences*, May, 1894).

<sup>2</sup> *Op. cit.*, p. 95.



to apply the left hand on the palpating right hand, and by this means I am enabled to press more evenly and steadily. The normal appendix is felt as a thin flat band, which slips away under the fingers, and is painless. But when it is in a condition of chronic inflammation, it is hard, round, unyielding, and more or less movable and tender.' We can also, by tracing the appendix from its point of insertion into the cæcum, get some idea of the direction in which it extends.

When one can be quite sure that one is feeling a thickened swollen appendix, it will be justifiable to recommend operation. Of course, the method is still easier under the administration of an anæsthetic. In acute cases it would not be justifiable to employ it, on account of the risk of diffusing pus into the peritoneal cavity.

With regard to the fallacies, the first fallacy is the presence of the psoas minor, the tendon of which is felt as a firm, rounded cord. The next fallacy is local contraction of muscular fibre, which, if oblique, may be some of the fibres of the external oblique, or, if vertical, may be the outermost fibres of the rectus. The third fallacy is that a roll of indurated adherent omentum may simulate a diseased appendix, and if enlarged calcareous glands are present in it, it may simulate a cystic appendix. But with these exceptions this method of diagnosing the condition of the appendix is a distinct advance, and should be steadily practised. But hitherto no method has been found by which we can ascertain the exact condition of the appendix—that is to say, as to whether it is acutely inflamed, whether there are necrotic patches present, or whether it is cystic, or what it is. But it would seem from direct observation that, in these recurrent forms, the condition of the appendix is one of chronic catarrh with extreme thickening. This is really an attempt at natural cure of the disease; but, unfortunately, the attempt is always more advanced towards



the free than towards the attached end, so that cystic disease is often present. So far as the actual mortality of these recurrent cases is concerned, it is much smaller than in a given number of first cases; but the importance of considering them lies both in the waste of time and pain to which they put the patients and the actual danger.

It is quite impossible to give a full description of all the possibilities that may be presented, but sufficient has been said to show the variable nature of the disease, and the unexpected results which may follow it. Nor is it necessary to discuss the question of chronic appendicitis as distinguished from recurrent, except to say that in the former the patient is constantly ill, and in the latter he is only occasionally so.

Tubercular appendicitis is rarer than one would expect, but, beyond presenting a history of long malaise and of a prolonged attack, it merits little or no special notice, nor does actinomycosis.

**6. Appendicitis in Childhood.**—In children it is frequently mistaken at its onset for some other disease, and is sometimes erroneously diagnosed as a dyspepsia, and, indeed, the first symptoms in some cases are purely dyspeptic, and in others they are referred to the bladder. A sudden onset of pain in the abdomen, with intestinal symptoms, should always raise the suspicion of appendicitis. The disease may take a bad course in consequence of large enemata being used, or the administration of purgatives. Sometimes important symptoms are absent, *e.g.*, vomiting. Some cases, seemingly prospering favourably, suddenly become worse, and have a fatal ending, because some pus is retained, which gives rise to metastatic deposits. In children, however, the most desperate cases may recover, and an operation may be successful when all hope seems gone. An operation is, therefore, justifiable even in diffuse peritonitis, in spite of the grave prognosis.



## CHAPTER V.

## COMPLICATIONS AND SEQUELÆ.

**Intestinal Obstruction.**—Fortunately, this, in its severest forms, is not often met with, but during the course of an attack there is frequently more or less obstruction of a mild form, which arises from a paretic condition of the intestinal walls. It passes off, however, as the acuteness of the attack subsides. Severe intestinal obstruction is met with occasionally, and is associated either with perityphlitic abscess or with acute general peritonitis. The actual cause of the obstruction is an adherent appendix, adhesions, or kinking of the bowel, which is bound down by adhesions, or a portion of bowel is adherent to the inflamed mass or to a band.<sup>1</sup> Again, a certain amount of more or less chronic obstruction, as evidenced by occasional feelings of nausea and frequent constipation, is met with long after an attack of appendicitis, and keeps the patient on tenter-hooks as to recurrence of the original state. At the time of such mild attacks borborygmi are met with, and flatus is very troublesome.

As an example of acute obstruction, I may quote the following case :

A boy, aged eleven, drank a large quantity of cold water in the afternoon of a hot day. During the following night he was seized with symptoms of acute appendicitis, with much distension of the abdomen. The diagnosis of appendicitis was made, and the incision was carried through the abdominal wall into the right iliac fossa. A small quantity of pus escaped. For five days the boy did extremely well,

<sup>1</sup> The converse is sometimes the case, *e.g.*, a case of acute intestinal obstruction caused by an adherent appendix vermiformis forming a band (*British Medical Journal*, 1899, vol. i., p. 1334).



the abdominal symptoms subsided, and he passed some liquid fæces. On the sixth day after the operation he commenced to vomit. I was called again to see him on the eighth day, and I found him suffering from acute intestinal obstruction. An incision was made into the middle line, in the hope that it might be possible to relieve it; but the whole of the small intestines were matted up into one large mass by adhesions, and it was absolutely impossible to separate them. The boy died on the eighth day after the first operation, or on the tenth day of attack.

Another case in point is the following, which is recorded by Drs. Abbé and Briddon<sup>1</sup>:

The boy had an attack of acute appendicitis. He was seen on the eighth day, and the usual operation for appendicitis was performed, and a perforated appendix lying in an abscess cavity was removed. He remained well for a week, but on the twelfth day, after three days of fæcal vomiting, a second operation was performed. At this time it was found that a coil of the small intestine was distended, kinked, and held by adhesions at the site of the appendix. It was freed with difficulty, and the gut was incised, and a pint of fluid fæces collected above the obstruction was evacuated. The gut was sutured, and the patient made an uninterrupted recovery.

Such cases as these might be multiplied considerably, but, at any rate, these two show the usual characteristics of intestinal obstruction following an attack of appendicitis.

**Pylephlebitis, Hepatic Abscess,<sup>2</sup> and Pyæmia.**—These severe and almost necessarily fatal complications are fortunately rare. The usual cause is a septic thrombosis of

<sup>1</sup> *Annals of Surgery*, vol. xix., p. 677. Cf. also case recorded by Dr. Gerster, *ibid.*, vol. xix., p. 682, and another by Drs. Wyeth and Markoe, *ibid.*, p. 678, and another by Sacquepée, *Bull. et Mém. de la Soc. Anat. de Paris*, February, 1899.

<sup>2</sup> For details of some interesting cases in which the abscess in



the radicles of the superior mesenteric vein. Thence a shower of emboli passes along the portal vein and lodges in the liver, setting up numerous small metastatic abscesses. As a rule, the infection stops short at the liver, but occasionally it extends further and to distant viscera, such as the lungs, brain and the spleen. A single large abscess may form in the liver, due to the detachment of a portion of the septic thrombus, which is carried whole to that organ. In most of these cases the appendix is either necrotic or gangrenous; but Dr. Payne has shown that pylephlebitis may occur simply with ulceration of the mucous membrane. The condition is as a rule fatal, but Treves<sup>1</sup> quotes the following case of his own:

‘I have opened the abdomen by an operation in a case of pylephlebitis following typhlitis in a girl of fifteen. The symptoms were very pronounced, and the patient’s condition apparently hopeless. The liver surface was dotted over with innumerable yellow specks described by pathologists. The patient made a good recovery.’

But the usual history of this complication is exemplified by the following case given by R. H. Harte<sup>2</sup>:

‘A male, aged twenty-five, had had good although not robust health until three years previously, when he had a short illness with cramp-like pains in the lower third of the abdomen following a chill. Two weeks previous to admission he had sharp pains in the right iliac fossa, with chilliness succeeded by sweating, nausea, and vomiting; then a succession of chills followed by profuse sweating for some days. The symptoms were referred to the hepatic region. The abdomen was opened, and the appendix was explored,

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relation to the appendix was attended later by suppuration in the neighbourhood of the liver, see H. Betham Robinson, *British Medical Journal*, 1899, vol. i., p. 1028.

<sup>1</sup> ‘Perityphlitis,’ p. 51.

<sup>2</sup> *Annals of Surgery*, vol. xx., p. 422.



but it was apparently healthy. After the operation he expectorated bloody mucus, and died ten days subsequently. A post-mortem examination revealed a slightly enlarged liver riddled with metastatic abscesses, which were largest in the left lobe. The appendix was entirely destroyed, and its site occupied by a small cavity containing 3 drachms of pus. The cæcum was gangrenous for several inches beyond its attachment to the appendix. There were also abscesses in the lungs.'

Other cases are recorded by W. J. Taylor and T. S. K. Morton.<sup>1</sup> It is possible that the above case in its earlier stages was one of those described by Dr. Payne in which pylephlebitis was associated with ulceration of the mucous membrane only of the appendix. It is evident that in such cases as these surgical interference at the later stages can hold out no hope of recovery. In the hepatic abscesses the pus is quite as foul as in the appendicular abscess, and the *Bacillus coli communis* is found in both.

**Pleurisy** is also met with as a complication, and it is usually right-sided. Hawkins<sup>2</sup> mentions that it has occurred in 2 cases out of 190 during an attack of simple perityphlitis, and remarks that this complication is of interest now that the *Bacilli coli communis* has been often found in the lung complication accompanying intestinal diseases.

**Thrombosis of the Right Iliac Vein**, with œdema of the right leg, is occasionally met with. Mynter believes it to be more dependent upon prostration and weakness, than upon the pressure and contraction of inflamed retro-peritoneal tissue around the external iliac vein, and this is Hawkins' opinion. Both Mynter and Treves mention that they have also seen thrombosis of the left femoral

<sup>1</sup> Mynter (*op. cit.*, p. 90) quotes the following statistics: Hepatic abscess—Hawkins, 1 case in 38; Fitz, 11 in 257; Mynter, 1 in 75; *i.e.*, 3½ per cent.

<sup>2</sup> *Ibid.*, p. 100.



vein, and this seems to support the view that the thrombotic condition is due to the feebleness of the circulation. Pulmonary embolism may further complicate cases such as these.

**Hæmorrhage**, either from the deep circumflex or from the iliac vessels, has occurred from invasion of their walls by the suppurative process. If large vessels are involved, a fatal result is not long delayed.

**Perforation of the Cæcum** occurs at one or more spots. It is an extension of the necrotic processes of the appendix in some instances, or is due to a softening of the cæcal wall in the presence of an abscess.

**Myositis of the Psoas and Iliacus Muscles** is also recorded, and accounts for the stiffness and flexion of the right lower extremity.

Appendicitis when it occurs in the course of **Pregnancy** assumes a grave aspect, in that abortion or miscarriage occurs, and a fatal result follows. Fowler<sup>1</sup> records four cases commencing with diffuse peritonitis, and all fatal, and Crutcher records another.

**Intestinal Fistula**<sup>2</sup> may be either external or into one of the viscera. If the latter be the case, then it is usually the result of leaving an abscess too long unopened. External fistulæ result from the same cause, and from imperfect methods of ligaturing the appendix, and of closing the opening into the cæcum, or it may be due to part of the cæcum becoming gangrenous. The position of the fistula is usually in the right groin. A case came before my notice in which an appendicular abscess had been left untreated for three weeks. By thoroughly opening up the sinus and

<sup>1</sup> *Annals of Surgery*, January, 1894, p. 46.

<sup>2</sup> Cf. cases by McBurney (*Annals of Surgery*, vol. xxi., p. 315); Perkins (*ibid.*, vol. xxiv., p. 726); Abbé (*ibid.*, vol. xix., p. 677); Rushmore (*ibid.*, vol. xxiv., p. 488). Mynter (*op. cit.*, p. 92) quotes Bull as having seen twenty-eight cases, and Paulier as having had four in forty-six cases. Cf. also Lilienthal (*Annals of Surgery*, vol. xxiv., p. 502), three cases.



carefully dressing it, the fistula closed in fourteen days. A faecal fistula has been found elsewhere, and even at the bottom of a hernial sac. They are often of long duration, and I can remember a case, when I was a dresser, which had been discharging for two years, leaving the patient in a very exhausted condition, and being ultimately fatal owing to extensive cellulitis over the right side of the abdomen. Such, however, is not the usual history of this complication, for the sinus eventually closes.

Mynter<sup>1</sup> notes that external fistulæ may occur not infrequently after operations on local circumscribed abscesses in which the appendix has been left behind. It is also particularly prone to occur when the appendix has become gangrenous, and a short rotten stump is left. In such cases it would be better to excise the appendix from the cæcum, and close the aperture in the latter by inverting it and securing it with Lembert's sutures.

**Metastatic Parotitis.**—This curious complication of abdominal suppuration has been noted to follow appendicular abscess, but is of less frequency than after diseases of the generative organs. We are indebted to Stephen Paget<sup>2</sup> for information on this subject, and he found that in 101 cases of parotitis the appendix was at fault in 5 cases.<sup>3</sup>

**Hypochondriasis.**—Of some patients who have been afflicted with appendicitis, it might be safely said that their brain is no longer in the cranial cavity, but in the right iliac fossa, for so fixed is their attention on that region that every ache and pain there, any delayed action of the bowels, prompts them to expect another attack of appendicitis, and to make their lives a burden to themselves and others. In

<sup>1</sup> *Op. cit.*, p. 92.

<sup>2</sup> *British Medical Journal*, March 19, 1887, p. 614.

<sup>3</sup> Floystrup had 3 cases of parotitis in 156 abdominal cases at the Commune Hospital, Copenhagen.



such instances a free life in the open air, with simple good food, effects a marvellous change for the better.

**Pregnancy.**—Appendicitis is occasionally met with in the course of pregnancy, and it involves grave danger to both mother and child. Vinay<sup>1</sup> records 4 cases, and in his article refers to 32 cases. In these 32 cases there were 10 deaths, a percentage of 31 per cent., which is higher than that of Armstrong in his series of 517 cases, with a mortality of 12·8 per cent. Abortion is noted in 40 per cent. of the cases. The frequency of abortion is much above that seen in infectious diseases, and it may be due to the close lymphatic connection between the appendix and uterine appendages. Clado has described an appendicular ovarian fold as being frequently present, and considers that this establishes the lymphatic connection. From a perusal of some of these cases, it is easy to infer that considerable difficulty may arise in diagnosing a right salpingitis in pregnancy from appendicitis.

## CHAPTER VI.

### DIAGNOSIS.

WITH a normally-situated cæcum and appendix, there are few diseases which present so definite a train of symptoms as an attack of inflammation in the right iliac region arising from appendicitis. The cardinal symptoms—the sudden onset with rapid rise of temperature, the acute pain in the right ileo-cæcal region, the vomiting and nausea, the tenderness and localized swelling—form a collection quite typical in character. But, unfortunately, the disease presents many stages and degrees, and any one of the cardinal symptoms

<sup>1</sup> *Lyon Méd.*, January 2, 1898. Cf. also an account of a case by Pinard, *Ann. de Gynéc.*, May, 1898.



may be absent or common to some other disease, so that difficulties arise as to the precise phase and nature of the attack. For instance, the position of pain is dependent upon the length of the appendix, the part of it which is diseased, and the direction which the diseased appendix takes. Pain may be also completely absent, as Mynter remarks, with a totally gangrenous appendix, and the patient be resting quietly in bed with normal temperature, pulse and respiration. The temperature and pulse are normal because toxins are not escaping into the general circulation, and pain is absent because the appendix 'is dead, nerves and all.'<sup>1</sup> Again, the swelling may be absent in acute forms when diffuse peritonitis is present, or may be masked in some obscure situation owing to the abnormal position of the appendix.<sup>2</sup> Most authors agree that tenderness on pressure is a constant symptom, but in women this may be due to right-sided ovaritis.

There are certain questions in any individual case which we naturally ask ourselves; these are well formulated by Mynter, and stand as follows:

1. Is it possible to diagnose the form of appendicitis present?
2. Will the appendix become perforated or not?
3. Has perforation already occurred?
4. Is it possible to diagnose the presence of pus, and of a local abscess?
5. Is acute peritonitis setting in?

1. As to the possibility of diagnosing the form of appendicitis present, no one can say during the first twenty-four hours of an attack what phase the disease will assume. If

<sup>1</sup> Morris, 'Lectures on Appendicitis,' New York, 1895, p. 41.

<sup>2</sup> For most instructive illustrations of the difficulty of gauging the value and importance of these symptoms, see 'Address on the Individual Value of the Symptoms in Perforative Peritonitis, more especially as regards Operation,' by Charters J. Symonds (*British Medical Journal*, vol. i., 1899, p. 517).



we wait until the third or fourth day the symptoms become sufficiently clear, and by waiting till the sixth day it is frequently possible to be sure of the presence of pus; but, unfortunately, during any one of the preceding days acute diffuse peritonitis may set in, and the patient may die before surgical assistance can be obtained.

2. Will an appendix perforate? In a first attack anything may occur, but in a recurrent attack the probabilities of perforation and acute diffuse peritonitis are less, and the more often attacks have occurred, the less frequent seems to be the liability to serious and fatal results.

3. By the third or fourth day it is possible to tell if one is dealing with a perforative appendicitis associated with acute peritonitis, localized or diffuse. But, as Mynter says, 'the point is to diagnose it before acute peritonitis is present, and not to wait until this has set in.' The symptoms indicative of this severe form of the disease are—firstly, a pulse-frequency out of all proportion to the fever present; secondly, severe and lasting pain; thirdly, rapid formation of a large swelling; and, fourthly, continuous vomiting. Symptoms such as these should suggest that one has to deal with an attack of grave form in which the foul contents of an inflamed appendix have escaped, and are giving rise to a peritonitis which may fortunately become localized, or with less frequency lights up the whole peritoneal cavity.

4. As to the presence of pus. This question has already been sufficiently gone into on pp. 49-51, and Mynter lays great stress on the presence of inflammatory leucocytosis with polynuclear cells. It is only necessary to recapitulate the following points which are associated with the formation of pus. These are, persistence of the symptoms after the fifth or sixth day, with gradual or sudden increase in their gravity; sudden elevation of the temperature or a persistent high temperature; a large swelling rapidly formed, with much local tenderness and rigidity of muscles; and the



presence of vomiting and diarrhœa during the early days of attack.

5. Is acute peritonitis setting in? It is possible to tell when this is present, but it is by no means easy to say if it is merely commencing. It is extremely difficult to disentangle the complex skein of symptoms, but one may say that those signs which indicate that the appendix is perforated will be present in a more marked degree when general peritonitis is setting in, and it is just in these cases that early operative interference is imperative. But cases have already been quoted in which acute implication of the whole abdominal cavity is present, and the patient is to all intents and appearances only slightly unwell, although within a measurable distance of fatal collapse.

### Differential Diagnosis.

Inasmuch as severe pain, collapse and vomiting are symptomatic of the onset of almost all acute abdominal diseases, it is impossible during the first few hours or the first day to differentiate appendicitis from other conditions. If, however, a definite train of appendicular symptoms be established in any given case, the nature of the affection becomes clear. But, unfortunately, symptoms distinctive in themselves are often absent or appear in unexpected sequence. There are a large number of conditions with which appendicitis may be confused.

**Intestinal Obstruction.**—It is the acute form mainly affecting the small intestine which gives rise sometimes to difficulty in diagnosis. More particularly is this the case when an intussusception is present. In acute intestinal obstruction the collapse is more marked. The pain is most severe in the umbilical region or at the site of the obstruction, and does not become localized in the right iliac fossa as in appendicitis. The vomiting in obstruction is not inter-



mittent, but constant, and the constipation often absolute from the first. Distension of the abdomen appears earlier in obstruction, and is more marked, while the temperature is lowered rather than raised. The confusion between appendicitis and obstruction has arisen from the fact that in both excessive pain and distension are present from the first, and vomiting and constipation are frequently met with in the early stages of appendicitis. It is more common for an appendicitis to be mistaken for an intestinal obstruction than for the reverse to occur. In a case of volvulus the symptoms of obstruction are of a fulminating character, and tenesmus and sanguineous discharge from the bowel are present. An examination *per rectum* will often help to clear up the case.

**Intussusception** in children and appendicitis have certain signs in common; thus, the onset is sudden, the pain is in the right iliac fossa, and here a lump may be felt. Treves<sup>1</sup> says that 'he has noted marked tenesmus in acute perityphlitis in children.' A rise in temperature is not common in intussusception, but I have seen it up to 102° on the second day. More often it is below normal. In intussusception the pain is intermittent rather than continuous, and is relieved by pressure. A tumour well defined in outline and movable is easily distinguished in the right iliac fossa by careful and prolonged palpation, and the tumour can be felt to harden from time to time, and it also varies in position. The striking point about intussusception is the discharge of blood-stained mucus from the bowel. A chronic intussusception with a good deal of thickening around the swelling may be difficult to diagnose from appendicitis, but an exploratory laparotomy is a resource that must not be neglected in cases of doubt.

**Renal and Biliary Colic** are also capable of giving rise to confusion, and not unjustifiably, for the appendix may be

<sup>1</sup> 'Perityphlitis,' p. 48.



turned towards the kidney or liver, and so give rise to tenderness in the lumbar region, or the ureter may be involved in an inflammatory appendicular mass, and symptoms like renal colic may supervene. In biliary colic the confusion may arise from a greatly distended gall-bladder, extending nearly as far as Poupart's ligament, becoming the seat of acute inflammation. The following table drawn up by G. R. Fowler succinctly expresses the distinctions between appendicitis, biliary and renal colic :

	Appendicitis.	Gall-stone Colic.	Renal Colic.
<i>Pain</i>	{ Around the umbilicus and epigastrium; does not radiate; also fixed pains in the ileo-cæcal region.	{ In the epigastrium, radiating towards the shoulder and scapula; fixed pains in the region of the gall-bladder.	{ Radiates down in the inguinal region towards the testis and rectum, with tenesmus of the bladder and rectum.
<i>Tenderness</i>	{ In the ileo-cæcal region, over McBurney's point.	{ Over the gall-bladder.	{ Over the region of the kidneys.
<i>Vomiting</i>	{ Present in the beginning, but ceases and recurs later in the disease.	{ Frequent and continuous.	{ Rare except in the beginning.
<i>Bladder and Testicle</i>	{ Symptoms rarely present.	{ Symptoms absent.	{ Irritable bladder, with dysuria, tenesmus, and occasionally hæmaturia; testicle retracted.

The diagnosis between the above conditions is quite clear when the distinctive symptoms are present, but if absent, or if the appendix be in an abnormal position, confusion will readily arise. Thus, in one of my own cases there was tenderness in the neighbourhood of the kidney, together with a tumour in the renal region, and pain passing downwards towards the bladder, with frequent micturition. On incision it was found that the appendix had extended upwards, and had caused a perirenal abscess in which the



ureter was involved. But in this case the urine contained no blood, pus nor albumin. Treves remarks that in the doubtful cases the tenderness of renal colic is more marked when the examination is made over the dorsal aspect of the kidney than over its abdominal aspect.

In biliary colic the onset of the pain is more sudden than in appendicitis, and the vomiting more severe. Tenderness over the gall-bladder is frequent, and there may be jaundice. Considerable help in making a diagnosis may be obtained by carefully considering the history of the case, and noting if the right iliac fossa be free from tenderness and swelling.

**Stercoral Typhlitis.**—In the all-absorbing attention devoted to appendicitis, it is highly probable that some cases of stercoral typhlitis<sup>1</sup> have been classed as appendicitis. That such an affection as the latter does exist there is no reason to doubt, as post-mortem examinations have shown inflammatory thickening around the cæcum and the site of ulceration, which thickening is justly believed to be stercoral in origin, from the history of prolonged constipation, and from the fact that the cæcum is loaded with fæces. Although the onset of this affection is characterized by the symptoms of a mild attack of appendicitis, yet the presence of a doughy, sausage-shaped tumour in the right iliac fossa from the very beginning of illness should suggest the nature of the affection. This disease is undoubtedly not very rare, and Renvers<sup>2</sup> has produced statistics taken from the records of the German army which show that it exists more frequently than is believed, and the fact that so many cases of typhlitis stercoralis end in recovery under medical treatment, and that confusion so easily arises between it and appendicitis, has led various observers to regard inflammatory swellings in the right iliac fossa, whether they be

<sup>1</sup> Cf. case by Gilbert Barling, *British Medical Journal*, vol. i, 1899, p. 733.

<sup>2</sup> *Deutsche Med. Woch.*, January 29, 1891.



typhlitic or appendicular, as of a benign nature. That they are often so in typhlitis admits of no dispute, but that they are equally apt to assume sudden and fatal forms if of appendicular origin is also without the pale of dispute. Cases of typhlitis stercoralis are suitable for medical treatment, while appendicitis frequently requires the assistance of a surgeon. Cases of typhlitis recover under the use of enemata, suitable diet and rest. It is very rarely that perityphlitis follows upon typhlitis, while the experience derived from operation shows that perityphlitis is an almost invariable accompaniment of appendicitis.

**Perforating Gastric Ulcer** has been mistaken for perforation of the appendix owing to the onset of both being characterized by sudden and intense pain, with profound collapse and some vomiting. But in perforating gastric ulcer the pain is usually in the immediate neighbourhood of the stomach, distension is more marked than in the upper part of the abdomen, and a careful inquiry into the previous history will often suffice to render the diagnosis clear. Perforating duodenal ulcers are more difficult of diagnosis than are gastric ulcers. Malignant disease of the cæcum<sup>1</sup> should not be confused with appendicitis unless, as occasionally happens, pus forms around the growth. But, as a rule, the age of the patient, the hardness of the mass, and its limited extent, together with the duration of the symptoms, will suffice to establish a distinction between growth and appendicitis.

**Typhoid Fever.**—Between typical cases of appendicitis and of typhoid fever there can arise no possibility of error, but in typhoid ambulans perforation is likely to occur, and then the symptoms closely simulate those of perforative appendicitis. Again, the onset of appendicitis is occasionally insidious, and the fever gradually rises, especially if

<sup>1</sup> But *cf.* case of cancer of appendix, Stimson, *Annals of Surgery*, vol. xxiii., p. 186.



septic symptoms are slowly developed. Should diarrhoea also be present, then error is quite possible. Some amount of local tenderness also may cause confusion between the two diseases, but in the present state of surgery, if an operation were performed for perforative appendicitis, and a perforative typhoid ulcer were found, the mistake would certainly be condoned, and be viewed with satisfaction if success followed. Many surgeons have been called to cases of supposed appendicitis, but a careful study of the temperature, the history, the state of the tongue, the peculiar stools, the large spleen and the rose-coloured spots have sufficed to render the case clear.

**Membranous Colitis**, either with or without ulceration of the ascending colon, has often been set down to appendicitis of a recurrent character, especially as the attacks of colitis are intermittent with intervals of good health, and are brought on by errors of diet, fatigue or cold. In both affections there are pain over the cæcum and ascending colon, and local tenderness. The passage, however, of mucus or mucus and blood with colic casts is characteristic of colitis.

**Tubercular Peritonitis.**—If there is much thickening of the omentum in appendicitis, and if the disease run a chronic course in young people of feeble constitution, with some sickness and obstinate constipation, it is difficult to be certain as to the origin of the trouble, and this doubt is only cleared up by operation, and then it may be found that tubercular peritonitis is associated with tubercular disease of the appendix.

From **Affections of the Pelvic Peritoneum and the Pelvic Viscera.**<sup>1</sup> It can be readily understood that, especially in women, difficulty may arise in determining the cause on the right side of the pelvis. Thus, I was consulted two years ago by a nurse with recurrent attacks of pain in the

<sup>1</sup> Cf. Bland Sutton, 'Appendicitis in Girls and Women,' *Clinical Journal*, March 14, 1900.



right iliac fossa and right side of the pelvis. These attacks were always worse at the menstrual period, there was a history of intermittent constipation and pyrexia, with occasional vomiting, and she was said to have had a definite attack of appendicitis some two years previously. The uterus was fixed on the right side, and the ovary was tender and enlarged. Upon operation I found that the appendix had dropped into the pelvis, and was adherent to the right Fallopian tube and the right side of the superior border of the uterus. Again, it may be very difficult to distinguish right pyosalpinx from an appendicular abscess, and an examination under an anæsthetic is usually called for. Should this fail to make the case clear, an exploratory incision should be made.

From **Abscesses arising in the Structures of the Right Loin**, such as psoas, lumbar and perinephritic. Here we must be guided by the history as to slowness or rapidity of onset, tubercular history, signs of spinal caries or of urinary mischief, and the absence of the cardinal symptoms of appendicitis.

From **Hip-joint Disease**. Many cases in children have been confused, but, as a rule, only when an abscess is present. This causes limitation in flexion of the hip, with pain running down towards the knee, and the child lies in bed with the thigh flexed on the pelvis, and is unable to submit to any methodical examination. The difficulty is further increased by the fact that the pus in an acute case of hip-joint disease may perforate into the pelvis, and form a fluctuating mass in the right iliac fossa. Such cases present no inconsiderable difficulties, but the safe rule is to feel for fluctuation and to open the abscess. The nature of the case will then be readily revealed. Gibney<sup>1</sup> and Treves<sup>2</sup> both dwell upon the probability of confusion in children.

<sup>1</sup> *Amer. Journ. of Med. Sci.*, January, 1881, p. 119.

<sup>2</sup> 'Perityphlitis,' p. 49.



## CHAPTER VII.

## PROGNOSIS.

GENERALLY it may be stated that appendicitis is not a disease to be dominated by statistics—at any rate, not by those available up to the present. In reviewing the literature, one is struck by the great divergence of results recorded by various observers. On the one hand we are assured by physicians that 80 per cent. get well without operation, and on the other hand a surgeon<sup>1</sup> tells us that of 558 cases 295 died—a mortality of 53 per cent. It should be remembered that physicians see cases of every degree of gravity, from the mildest to the most severe, the mildest cases predominating in number. Hence the natural result is for them to regard the disease as one not of exceptional gravity, while surgeons, on the other hand, are called, as a rule, only to the severer varieties, many cases of which prove fatal if they are not operated on early. Again, as to the validity of medical statistics, none of them could be regarded as complete unless the life-history of each patient is carefully recorded, and a note taken as to the presence or absence of subsequent attacks, their number and severity, and whether the patient ultimately died of the recurrent form. A mild case enters a hospital, is placed under medical care and recovers, and is recorded as a recovery under medical treatment. But how often is it possible for a physician in busy practice to trace all his cases, and to ascertain that none have died from succeeding attacks?

On the other hand, surgeons, especially some American surgeons, have been so struck by the dangers of delay,<sup>2</sup> and

<sup>1</sup> Dr. S. Lloyd, New York, *Journ. of the Amer. Med. Assoc.*, May 2, 1896.

<sup>2</sup> Thus W. W. Keen (*Annals of Surgery*, vol. xiii., p. 255): 'For every case in which operation has been a mistake, ten can be found where waiting was fatal.'



by the fulminating character of some attacks, that they have deliberately expressed the opinion that all cases which do not improve within forty-eight hours from the onset of the attack should be subjected to laparotomy.<sup>1</sup> So far as definite prognosis is concerned, no satisfactory results can be arrived at until appendicitis is placed in the category of purely surgical diseases to be treated in surgical wards from the first, not necessarily with the view of operation, but in order that any delay in seeking surgical advice, which is so fruitful in disaster, may be avoided. Why cases should wait until pus has formed, or peritonitis is present, to be transferred to the surgeon, who is then called upon to assume all the responsibility, is not clear. Undoubtedly, he who operates is the best judge of when to operate, and how long to withhold his hand. Experience in the past has shown that medical measures alone cannot cure cases permanently, for a considerable number recur. There can be no doubt that spontaneous cure is rare, and can only occur without operation by obliteration of the appendicular canal.

It is, however, quite another matter to excise all inflamed appendices on the supposition that a small number of them will perforate. Such cases as the last-named are not the rule, and, as Treves puts it, 'they cannot be anticipated, and they are not difficult to recognise.' Routine laparotomy in all cases of over forty-eight hours' standing represents the extreme swing of the pendulum from the position of 'do nothing but wait' of twenty years ago. Until appendicitis is recognised as a purely surgical disease from the first,

<sup>1</sup> The Society of Surgery of Paris, after three months' discussion, came to the following conclusions: 1. There is no medical treatment of appendicitis. 2. In acute cases operate as soon as possible after the diagnosis is made. 3. In doubtful cases it is better to operate. 4. In subacute attacks it is better to wait, and operate between the attacks. 5. Suppurative appendicular peritonitis demands instant operation. 6. In slight cases it is less risky to operate at once than to wait and operate, and diagnosis, especially in the early stages, is anything but easy. 7. The stages of operation must vary according to the needs of each case (*Lancet*, vol. i., 1899, p. 1332).



statistics bearing on prognosis will always be conflicting, and results will be capable of improvement.

The following points, then, may be advanced for discussion :

1. What proportion of cases recover under medical treatment alone, and how far is it likely that surgical interference would reduce the mortality ?
2. Upon what conditions does the success of surgical treatment depend, and what are the results ?
3. What is the probability of relapse in a case treated medically, and what is the result of operative interference ?
4. Can the results be improved by treating all cases surgically, so soon as the disease is diagnosed ?

1. *What proportion of cases recover under medical treatment alone, and how far is it likely that surgical interference would reduce the mortality ?*

J. W. White<sup>1</sup> believes that about 80 per cent. recover under medical treatment, while of the remaining 20 per cent. at least one-half may be saved by opening a localized abscess, and a small proportion of the remaining half, the subjects of perforation with diffuse peritonitis, will recover after operation. The percentage of recoveries in cases of the last-named description must necessarily be small, but it is such as to give great encouragement. Carrying to its conclusion Professor White's opinion, we may say, then, that the medical mortality of 20 per cent. will be reduced to something under 10 per cent. of all cases by surgical interference. But, as I have so often insisted, it is impossible to tell at the beginning of a case if it will be a mild or severe one, and, further, the untrustworthiness of medical statistics is great because no physician has, so far as I know, attempted to follow out the after-history of a

<sup>1</sup> *Therapeutic Gazette*, June 15, 1894.



given number of cases admitted into one hospital and treated medically. I suspect that, if this were done, the proportion of medical deaths would be much greater than it is. Professor With's<sup>1</sup> tables from 1879, *i.e.*, before the period when operations for appendicitis came so much into vogue, give twelve deaths in thirty cases, or nearly a 50 per cent. mortality under the more or less strict opium treatment.

2. *Upon what conditions does the success of surgical treatment depend, and what are the results?*

The prime condition must necessarily be the state of the parts affected. It is certain that a fair proportion of cases with gangrene, perforation of the appendix, and acute peritonitis, will die; but about one in three<sup>2</sup> may be saved. Now, what are the factors which influence this proportion? The chief is the time of operation. Fowler<sup>3</sup> has furnished us with certain facts which guide us in this matter. Of 127 cases, in nearly all of which septic peritonitis was present (Mynter), of cases operated on in the first three days 83 per cent. recovered, and the percentage diminishes until on the sixth day it had fallen to 58 per cent., and on the ninth day to 33 per cent.; *i.e.*, of ten cases sufficiently severe to be operated on, eight will recover if operation takes place in the first three days, six if on the fifth or sixth day, and three if on the ninth or tenth day—a sufficiently striking statement of fact, and one not to be lightly disregarded. Fitz's<sup>4</sup> statistics are equally to the point. Other factors there must necessarily be which influence the success of surgical treatment. These are the ability and skill of the operator, his knowledge of the technique of aseptic abdominal surgery, and his readiness and resource in meeting and overcoming unexpected difficulties. Such points are not capable of discussion.

<sup>1</sup> 'Festskrifter ved. Kjobenhavn's Univers,' 1879.

<sup>2</sup> Cases with gangrene, perforation and diffuse peritonitis.

<sup>3</sup> See tables at end of chapter.

<sup>4</sup> Ditto.



The general result of operation for all conditions is a mortality of 5 per cent. This is small, considering the nature of the disease and the difficulties which surround the operation, and a case once efficiently operated on ought to be free from the danger of a relapse. These facts appear, to my mind, to point to the following conclusions, two of which have been laid down by Porter<sup>1</sup>:

- (a) 'When an operation is to be performed, the sooner it is done the better are the chances of recovery.'
- (b) 'The character of the attack and the consequent condition of the patient, and not the number of hours and days of illness, should form the basis of decision as to the proper time for operation.'

And to these conclusions I would add another:

- (c) If the condition of the patient is such that the question of operation is submitted for serious discussion—*i.e.*, if it is felt that the case may come to an operation sooner or later—then it is better to operate at once, and not to delay.

Appearances, in a case of appendicitis, which are sufficient to induce doubt as to the efficiency of medical treatment are those which justify *early* surgical interference, and it is those cases which, when taken early, yield a good result.

3. *What is the probability of relapse in cases treated medically, and what are the results of operative interference?*

It may confidently be stated that 30 per cent. of all cases treated medically suffer relapse, not necessarily acute attacks, but they suffer colicky pain, local rigidity, occasional vomiting, and constipation. In fact, 30 per cent. may be considered under, rather than over, the estimate. And many patients suffer not one relapse, but several—even as many as nine or ten—so that their life is a burden

<sup>1</sup> *Amer. Journ. of Med. Sci.*, 1893, p. 649.



to them. It is known that as a rule a relapse is less serious than the first attack, but with each successive attack the danger does not progressively diminish. In some one or other of the attacks, acute perforation and peritonitis may occur and carry the patient off. It is also known that patients are more likely to recover from operation for relapsed appendicitis than from a first attack, probably because the peritoneum has already been rendered somewhat immune. Professor White,<sup>1</sup> quoted by Mynter, says: 'It must therefore be decided whether medical treatment or operation offers the best chance for recovery in these (relapsing) cases. And in reaching this decision it is impossible to ignore the oft-repeated assertion that all cases are essentially infective, and that recovery from any particular attack is, as a rule, only apparent and temporary, not real or permanent.' With this opinion most writers are fully agreed, and with surgeons it is almost unanimous.

The results of operative interference in these relapsing cases, if a quiescent period be chosen for operating, are better than in primary attacks. Treves<sup>2</sup> gives a mortality of 1 per cent. But it is not always possible to remove the offending appendix, chiefly because of the dense nature of the adhesions and the frequent difficulty of identifying the diseased organ.

4. *Can better results be obtained than at present by treating all cases surgically so soon as the disease is diagnosed?*

This is, of course, a vexed question, and it is the one where progressive surgeons join issue with the majority of writers. The justification advanced for abdominal incision in all cases within the first twenty-four or forty-eight hours is the probability of a certain number of these cases developing acute and diffuse peritonitis which might have been averted by an early operation. Now, in such cases the very first symptoms noticed are those of acute and diffuse peritonitis,

<sup>1</sup> *Op. cit.*, p. 122.

<sup>2</sup> *Op. cit.*, p. 60.



and are not difficult of recognition. Of course, in these circumstances instant operation *is* essential, but it can hardly be said that the occasional occurrence of fulminating attacks affords sufficient grounds for the use of the knife in all cases, whether mild or not. A reference to statistics, and especially to the able statements of H. P. Hawkins, convince us that facts have not yet come to light sufficiently cogent to sum up the treatment of appendicitis by the dictum, 'Operate on all cases so soon as diagnosed.'

That some cases have been allowed to drift into septic peritonitis is an argument for earlier operation, but not for indiscriminate operation. In fact, as Treves<sup>1</sup> says: 'It would be as wise to advise immediate operation in all cases of ulcer of the stomach as soon as a diagnosis is made, because some cases of ulcer of the stomach end in a fatal perforation.' A large majority of the cases of appendicitis get well spontaneously, a smaller number end in localized abscess which can readily be got at, but an exceedingly small percentage commence with symptoms of diffuse peritonitis, and in some even of these, after a day or two, the diffuse signs become localized to the right iliac fossa. The questions we must ask ourselves are, in the words of Hawkins<sup>2</sup>: 'Does it appear probable that by a routine excision of the appendix at a very early period some few cases might be saved from general peritonitis?' 'Will the result in gain to life on this plea alone be large enough to counterbalance the disadvantages of the wholesale surgery which such a practice would entail?' 'Is the mortality of the operation itself so small that it can be neglected?' I am strongly inclined to think that no judicious surgeon is prepared to tie himself down to the practice of routine early operation in all cases, but would prefer to watch his cases closely, and when in doubt operate at once.

<sup>1</sup> *Op. cit.*, p. 57.

<sup>2</sup> *Op. cit.*, p. 130.



## PROGNOSIS STATISTICS.

P. Guttman, Moabit Hospital in Berlin, 1879-1890: 96 cases, 5 deaths = 5 per cent.

Fowler, Middlesex Hospital, 10 years: 99 cases, deaths = 15 per cent.

McDougall, Edinburgh Royal Infirmary, 3 years: 150 cases, 37 deaths = 25 per cent.—St. Bartholomew's and St. Thomas's Hospitals, deaths = 20 per cent.

Professor With, from 1879: 30 cases, 12 deaths = 40 per cent.

Floystrup, Commune Hospital, Copenhagen, 1875-1887: 156 cases (under opium treatment), deaths =  $15\frac{1}{6}$  per cent.

J. W. White believes facts to be as follows: Under medical treatment mortality = 20 per cent. Operation on the severe cases would reduce it to 5 or 8 per cent.

Dr. Samuel Lloyd, New York, 558 cases:

*Conservative v. Operative Treatment.*

263 recovered	295 died	= 53 per cent.
226 operated upon	31 "	= 13 "
265 treated conservatively	205 "	= 77 "

445 resulted in perforation or diffuse peritonitis = 79 per cent.

But these figures are quite at variance with the general run of statistics:

Sahli, 7,213 cases from 466 physicians:

473 operated upon	...	...	mortality = 21 per cent.
(The result of operating only in severe cases, and then too late.)			
6,740 treated conservatively	...	...	mortality = $8\frac{8}{10}$ per cent.
4,592 cases relapses occurred	...	...	= $28\frac{8}{10}$ "

Fowler, 127 cases:

1st three days	58 cases operated on	recovery = 83 per cent.
4th day	9 " " "	= 60 "
5th to 6th day	26 " " "	= 58 "
7th " 8th "	18 " " "	= 50 "
9th " 10th "	9 " " "	= 33 "

Thus, one-half of all patients who would have recovered by operation die if they wait till sixth day.

## Mortality under Surgical Treatment.

				<i>Deaths.</i>
Wyeth	...	364 cases operated on	...	18 per cent.
Murphy	...	194 " " "	...	$9\frac{6}{10}$ "
Morris	...	100 " " "	...	7 "
"	...	100 " " "	...	2 "
<hr/>				<hr/>
		758 " " "	...	37 "
				Average about 5 per cent.



Cases with Gangrene, Perforation and Diffuse Peritonitis.

		Cases.		Deaths.
Fowler	...	32	...	32
Fenger	...	11	...	10
Mynter	...	33	...	15
McBurney	...	24	...	10
Willy Meyer	...	4 (when operated in- side of 12 hours)	...	1
Richardson	...	32	...	23
Mikulicz	...	11	...	9
Sonnenburg	...	13	...	12
		160		113
				Average 70½ per cent.

Relapses.

Professor With	...	30 per cent.
Hawkins	...	23 $\frac{6}{10}$ "
Fitz	...	44 "
Mynter	...	47 "
		Average 36 per cent.

Previous Attacks.

Hawkins (59 in 250 cases)	...	Percentage.
Fitz	...	23 $\frac{6}{10}$
Mynter (35 cases)	...	44
		47

Albert Wood quotes :

		Percentage.
Irish	...	50
Richardson	...	49 $\frac{4}{10}$
Price	...	50
Ranzhoff	...	13
Knaussold	...	23
Krafft	...	22
Porter	...	9 $\frac{5}{10}$
Bryant	...	11-17
Sahli	...	20
Gage	...	33 $\frac{5}{10}$
		Average 29 $\frac{1}{10}$

Wyeth: 20 per cent. recover perfectly after one attack, and without having a recurrence.

Willy Meyer: 10 per cent. recoveries.

Lennander: All patients have relapses.

Sonnenberg warns against accepting physicians' reports of spontaneous recovery.



## Relapses.

		Cases.			Relapses.
Fowler	...	17	...	...	2
Barton	...	20	...	...	2
Richardson	...	40	...	...	2

Wood states less than 5 per cent.

## Treatment.

Hawkins: 264 patients, St. Thomas's Hospital, mortality = 14 per cent. 190 had simple adhesive appendicitis; 36 had localized peritonitis, and 10 died; 38 had diffuse peritonitis, and 27 died.

Of the 190, 45 had had one or more previous attacks; 38 progressed to formation of pus. Of these 38, 10 died; 7 had had previous attacks, and 4 of them died.

Of the 74 cases of localized and diffuse peritonitis together, 37 died = 50 per cent.

Of the 38 cases of diffuse peritonitis, 27 died = 77 per cent.

59 relapsed, and if they had been operated upon successfully at the first attack, 7 lives would have been saved and 52 spared illness.

Sonnenberg: 130 operated cases. Not one case found to be primary typhlitis. 17 cases simple appendicitis—all recovered; 74 cases perforative appendicitis, no complications—all recovered. Of these—

1	case	2nd	day
3	cases	3rd	day
11	"	4th	"
9	"	5th	"
3	"	6th	"
3	"	7th	"
—			
30			

26 in 2nd week, 18 later.

22 cases of perforative appendicitis with complications—12 died = 55 per cent; 15 cases of perforative appendicitis with septic peritonitis—all died. Total 128.

Lennander in Upsala: 68 cases. Early laparotomy, 16 recovered, 1 died. Localized abscesses, 14 recovered, 1 died. Diffuse peritonitis, 60 per cent. mortality. Chronic appendicitis, 21, all recovered. Gangrene, but no perforation, 8 recovered, 2 died.

Dr. Floystrup: 156 cases, 24 died =  $15\frac{4}{10}$  per cent. Diffuse peritonitis, 13 died. Circumscribed abscesses perforating, 8 died. Retro-peritoneal abscesses (the only ones operated upon, viz., 4 cases), 3 died.

Halliday (*British Medical Journal*, 1898, vol. i., p. 1194), 100 consecutive cases:

- A. Simple appendicitis without suppuration, 64 cases.
- B. Appendicitis with abscess, 22 cases.
- C. Acute perforative appendicitis with general purulent peritonitis, 14 cases.



55 cases were operated on, with a mortality of 20. Of 64 cases in Class A, the appendix was removed during an interval in 25, and in 1 case was fatal. Of Class B, 17 recovered and 5 died. Of Class C, all 14 died.

#### *Medical Treatment.*

Professor With kept patient constipated for 24 days, if necessary, by use of opium:

Localized or less severe forms: 5 or 8 drops tincture 3 times a day for 10 days; has been increased to 10 or 15 drops.

More severe forms: 10 drops 3 times a day, up to 24 days, and an evening dose of 15 drops, or morphine injection  $\frac{1}{8}$  grain; has been increased to 15 or 20 drops, and  $\frac{1}{2}$  grain morphine several times a day.

Diffuse peritonitis: 10 or 20 drops every  $\frac{1}{2}$  or 1 hour, and repeated injections of morphine; has been increased to 20 or 30 drops, with injections of  $\frac{1}{2}$  or  $\frac{3}{4}$  grain morphine 3 times a day.

#### *Results of Treatment.*

In all cases, mortality 16 per cent.

Diffuse peritonitis, 14 cases, 12 died } 70 per cent. in

Localized abscesses, 6 cases, 2 died } serious cases.

Dr. Floystrup's 156 cases, 24 died =  $15\frac{4}{10}$  per cent.

Diffuse peritonitis, 34 cases, 13 died = 40 per cent. } Together

Localized abscesses, 57 cases, 8 died = 14 per cent. } 23 per cent.

#### *Surgical Treatment.*

##### OPERATION IN DIFFUSE PERITONITIS.

		Cases.		Deaths.		Percentage.
McBurney	...	24	...	10	...	41
Richardson	...	32	...	23	...	75
Fenger	...	11	...	10	...	91
Mikulicz	...	13	...	9	...	69
Mynter	...	20	...	15	...	75

## CHAPTER VIII. TREATMENT.

THE treatment of appendicitis may be described as non-operative and operative, and the latter may be carried out either during an acute attack or in the quiescent period.

**Medical or Non-operative Treatment.**—Inasmuch as this form of treatment falls to the lot of the physician, he is naturally fully acquainted with the history of the disease, its possible complications and sequelæ, so that he should know when to call in a surgeon, and thus avoid the disasters



which occasionally occur from delay in operating. The patient should be confined to his bed absolutely; warm fomentations or turpentine stupes are applied to the abdomen, and a full dose of tincture of opium is given, or  $\frac{1}{6}$  to  $\frac{1}{4}$  grain of morphia is injected. The value of morphia or opium in these cases is considerable, as it relieves the excruciating pain, and doubtless prevents peristalsis. But the moment the pain is relieved the morphia should be discontinued. If there be excessive vomiting, no food should be given by the mouth until it has ceased, and then only in fluid form, hot, and in small quantities. Beef-tea and essences of meat are preferable to milk, unless the latter is peptonized. To allay thirst, small quantities of hot weak tea, or barley-water, or toast-and-water may be taken from time to time. Iced drinks are to be avoided.

The question will arise, Should a purgative be given? This will depend upon the nature of the attack. It is entirely to be avoided if the onset is acute, but if of the mild relapsing variety, 1 grain of calomel, repeated twice or thrice at intervals of three to four hours, is of service, and sometimes cuts short the illness. If no action follow, an enema may be employed. Should no evacuation follow, neither purgatives nor enemata are to be again used. It is always best to be on the safe side of constipation, and, indeed, in anything but the mildest attack the 'fatal' purgative is to be shunned. When all pain has subsided, and there is not much local tenderness or severe symptoms on the fifth or sixth day, a glycerine enema is of value. When the bowels have once acted naturally after this time, and if the local pain and swelling have subsided and the temperature fallen, a dose of sulphate of soda or other saline aperient is useful, and, indeed, necessary, as peristaltic action is frequently sluggish for some weeks after an attack.

When the temperature has fallen, and the tongue has cleaned, an advance may be made towards solid food by



giving toast and peptonized milk, a little bread, without the crust, and butter, then gradually advancing to fish, and finally, when the bowels are acting freely, to fowl and meat.

Leeches are advocated by Hawkins and Treves for the relief of pain with a large local swelling. They are valueless if suppuration is present. Intestinal antiseptics, such as salol,  $\beta$ -naphthol, and salicylate of sodium, may be given when the bowels are acting freely. With regard to the maintenance of rest, it is better to err on the side of caution than to get the patient up hastily. When he is up, he should wear a pad and bandage lightly applied over the right iliac region. This relieves the uneasy feelings in the part, and may promote absorption. In the interval between the attacks, attention to certain rules and regulations will often enable a patient to avoid a repetition of the trouble. The most important point is the digestion, and every effort should be taken to ensure that this proceeds in a normal manner. On inquiry it is usually found that a relapse takes place from some indiscretion of diet, more especially from the bolting of hastily masticated portions of food. It is essential to see that the teeth are in proper order, and if necessary the patient should have false ones supplied. The meals also must be taken at regular hours in moderate quantity, and eaten slowly, and about three-quarters of an hour to one hour's rest should be allowed after each meal. The food, of course, must be simple and digestible, and a patient with common-sense knows quite well what things agree with him and what things disagree with him. Such articles as lobster, crab, shell-fish, strawberries, currants, and fruits containing small seeds, should be carefully avoided.

Due attention must be paid to the bowels. These should act regularly every day, and constipation must be sedulously avoided. It is also important to caution the patient against running the risk of taking cold, and he should be enjoined



not to undertake any arduous form of exercise, but moderate quiet exercise in the open air should be encouraged. It is also important to prevent decomposition as much as possible in the intestinal tract, and for this purpose 10 grains of salol night and morning, or a similar dose of  $\beta$ -naphthol or a little calomel from time to time, is very advantageous. If the patient observe these rules carefully and conscientiously, it may well happen that he will not suffer from another attack.

**Operative Interference.**—This is undertaken under three conditions: (a) In localized abscess; (b) in diffuse peritonitis; (c) in relapsing cases.

(a) *Localized Abscess.*—The size and the position of the abscess vary considerably. In some instances there is a small localized deep-seated abscess in connection with a perforated appendix. Such a condition is met with early in the illness, in the first five days. More often, however, there is a large abscess limited by adhesions, not communicating with the peritoneal cavity, and easily reached. In other instances, dependent upon the position of the appendix, the abscess may lie behind the cæcum, and point in the lumbar region, or it may track inwards towards the middle line. Under each of these circumstances some modification of the usual method of opening an appendicular abscess must be adopted. The indications of the presence of pus have already been fully given, but it is wrong to wait until one is quite sure of the presence of pus, for sometimes it is too late. Operation should be undertaken when pus is merely suspected.

In the case of the large abscess which is usually found after the first week, and is dependent upon perforation of an appendix lying on the outside of the cæcum or below it, the pus will be found either in the retroperitoneal tissue in front of the iliac fascia, or behind the transversalis fascia; or it may still be within the abdomen, but localized by numerous



adhesions which separate the abscess from the intestines. It is best then to make an incision 3 or 4 inches long, and parallel with the outer half of Poupart's ligament, reaching rather above the anterior superior spine. The incision passes through skin, subcutaneous tissue, the aponeurosis of the external oblique muscle, the internal oblique, and the transversalis muscle and the transversalis fascia. If in the subperitoneal fat or in the deeper tissues there be œdema present, then there can be no doubt of the existence of pus. The surface of the peritoneum should now be carefully inspected and palpated. In many cases the presence of the abscess may be recognised by an opaque appearance of the peritoneum. In other cases a little palpation suffices to recognise fluctuation. The abscess must now be opened on its outer side, and as far away from the middle line as is possible. It is opened with a blunt instrument, and the opening dilated with dressing forceps. Two large drains should be left in, and the wound allowed to granulate. Before putting in the drainage-tube, it is advisable carefully to wash out the abscess cavity and to search for any fæcal calculi. In cases where the appendix has turned toward the middle line, the incision should be made over the most prominent part of the tumour, and the abscess opened as much towards its lateral aspect as possible. If this be done, there is no danger of entering the general peritoneal cavity. If, however, this occurs by accident, the opening in the peritoneum can easily be stitched up, and the abscess tapped in another place. In cases in which the abscess is somewhat small, and is well toward the median line of the abdomen, some difficulty may arise in localizing it. In such a case the peritoneum may be opened, and pus carefully sought for. Should it be found, before fully opening the purulent cavity the parts around should be packed with sponges or with iodoform gauze. Pus may then be gradually evacuated, the abscess cavity washed out and cleansed with peroxide



of hydrogen solution, and a drainage-tube introduced. If there be any possibility of the escape of pus into the peritoneum, iodoform-gauze packing should be used. The important question will arise, Should the appendix be removed in this stage? As a rule, not. If, however, it is found floating loosely in the pus, there can be no objection to removing the gangrenous part of it. But it is not, as a rule, desirable to make a prolonged search and lengthen the operation in order to remove an appendix. These cases do very well eventually if the appendix be allowed to come away with the discharge.<sup>1</sup> There may be some fæcal discharge from the wound, but that ceases, as a rule, after a few days.

If an operation be done early in an attack of appendicitis, *i.e.*, on the second or third day, with the object of exposing and removing the diseased appendix, the following steps should be carried out: An incision 4 inches long is made obliquely across McBurney's point, and the abdominal wall divided layer by layer until the peritoneum is exposed. A small opening is made through the membrane and any serum or sero-pus evacuated through the small opening. The next step is to enlarge this opening, expose the appendix, and pack with sponges, so as to keep the bowels well away from the area of operation. Mynter states that, as a precaution, he always introduces a large sponge into the pelvis, in order to protect that region. If the appendix be not readily seen, careful search must be made for it within the sponge-protected area. The appendix should then be freed with extreme care. Much difficulty is often experienced at this stage of the operation, and it is better to commence to loosen the appendix from its tip, securing the rent in the mesentery as the separation is proceeded with.

<sup>1</sup> Du Champ (*Loire Médicale*, December 15, 1898) gives details of a case which he opened from the rectum, as the abscess was projecting into its anterior wall.



The appendix may then be severed from the cæcum, but care must be taken that the separation is through healthy tissues; otherwise a fæcal fistula may result.

The stump of the appendix is treated as follows, and the method is applicable both to cases of this early description and to relapsing cases. The method is that of R. Dawbarn. A continuous Lembert suture is passed through the peritoneal surface of the cæcum about  $\frac{1}{4}$  inch from the base of the appendix, and tied loosely. An incision is made through the serous and muscular coats of the appendix about  $\frac{1}{2}$  inch from its base, and the sleeve so formed is turned back. The mucous coat is next divided close to the cæcum, and to prevent the escape of the cæcal contents the first suture in the cæcum may be pulled upon. It is often preferable to place a ligature around the mucous coat of the appendix before dividing it. Whether this is done or not, the next step is to scrape the inner surface of the mucous membrane of the appendix thoroughly with a sharp spoon, and apply pure carbolic acid. The sleeve of peritoneal and muscular tissue is now turned in over the stump of mucous membrane, and is somewhat invaginated, so that serous coat is opposed to serous coat. Four to six Lembert sutures are then applied so as to seal the aperture firmly. Dawbarn advises that if the appendix is very stiff, or is gangrenous near its insertion, not only should the first suture through the cæcum be tightened up, but also a second suture should be placed in the cæcum  $\frac{1}{4}$  inch from the first. One distinct advantage in ligaturing the mucous membrane stump of the appendix before it is divided lies in the fact that hæmorrhage from vessels in the mucous membrane is thereby avoided. The peritoneal cavity is then thoroughly washed out with boiled water, and a glass drainage-tube passed well into the pelvis and packed with iodoform gauze, and the wound is partially closed. In three or four days, if the discharge is sweet, the



tube may be removed, but the iodoform-gauze packing should be changed daily.

(b) *Diffuse Peritonitis*.—In operating for diffuse peritonitis the indications have already been given on p. 65, and everything here depends, first, upon the time when the operation is done, and, secondly, upon the conditions met with. If an appendix is gangrenous but not absolutely perforated, and the serious condition of the patient is recognised early, much may be hoped for. If the perforation is small, and, as Mynter remarks, if there is stricture of the appendix present which prevents the contents of the bowels from flowing out, the prognosis is moderately favourable with early operation. If, however, the appendix is gangrenous, and a large communication exists with the cæcum, so that stinking matter is exuded in large quantities into the peritoneal cavity, then, in spite of early operation, the case is practically hopeless. In cases of diffuse peritonitis, an incision 4 or 5 inches long should be made immediately above and parallel with the outer part of Poupart's ligament and the front part of the crest of the ilium. All fluid is sponged from the peritoneal cavity, and the appendix taken away. The sponging must be thorough in every direction, and then the abdomen should be irrigated with hot normal saline solution, *i.e.*, 0·6 per cent., and the excess of fluid sponged away. But vigorous sponging is not to be advocated, as it damages still further the peritoneal endothelium. A glass drainage-tube is then placed well down in the pelvis, and the cæcal region packed around the tube with iodoform gauze. The statistics given by American authors are decidedly encouraging. The conclusion to be derived from a perusal of the statistics is that by early and immediate operation in such cases of diffuse peritonitis about one patient in four may be saved.

(c) *Operation for Relapsing Appendicitis*.<sup>1</sup>—The best incision

<sup>1</sup> A useful paper by Gilbert Barling (*British Medical Journal*, 1898, vol. i., p. 292) may be consulted on this subject.



through the skin is an oblique one 3 to 4 inches long, with its centre at McBurney's point, and passing across the abdomen obliquely from without inwards. The external oblique aponeurosis is then defined, and it is split in the direction of its fibres. The internal oblique and transversalis are also split in the direction of their fibres, and the fascia transversalis and peritoneum are opened in a line parallel with the median line of the body. The rectus sheath should be left untouched, to avoid troublesome hæmorrhage from small branches of the deep epigastric artery. It is often better to draw the outer edge of the muscle inward, and incise the peritoneum beneath the normal position of the outer border. The object of dividing the various layers of the abdominal wall in the manner just described is to avoid a ventral hernia,<sup>1</sup> and the overlapping of the rectus after the retractors which have held it have been taken away is of particular service in this direction. The only drawback to the method is a slight one, namely, that the bottom of the wound is rather small on account of the different directions in which the layers have been cut, and the skin incision has therefore to be rather large. The appendix is found and brought to the surface of the wound,

<sup>1</sup> F. B. Harrington (*Phil. Med. Journ.*, June, 1899) examined the condition of the abdominal wall in 236 cases of appendicitis which had been operated on at the Massachusetts General Hospital by various surgeons. They represented all varieties of the disease. The period which had elapsed since the operation varied from nine months to nine years. Total number examined, 236, viz., males, 190; females, 46. 27 true hernias in all, or  $11\frac{1}{2}$  per cent.; 85 wounds closed at the time of operation resulted in 3 hernias, or  $3\frac{1}{2}$  per cent.; 35 wounds partly closed at operation, 11 hernias, or  $12\frac{1}{2}$  per cent.; 63 wounds left entirely open at time of operation, 13 hernias, or 20 per cent. If with these cases of true hernia were included 10 cases of punctiform hernia, and 53 cases of more or less bulging of the scar which did not constitute hernia, the following percentage of weak scars was noted: In 85 closed wounds, 6 per cent.; in 88 partly closed wounds, 51 per cent.; in 63 open wounds, 62 per cent. Harrington therefore advocated the use of an enlarged McBurney incision in all acute cases. As hernia is more common where drainage has been used, he advises as little drainage as possible, and early removal of the drain.



and amputated in the manner described on p. 89. All hæmorrhage is carefully arrested, and each layer of the abdominal wall carefully sutured separately with interrupted silk or catgut sutures. No drainage is required unless there has been much disturbance of the parts in separating adhesions.

A word may be added with reference to the retrocæcal suppurating form of appendicitis. It is in these cases that the swelling is deeper and less defined early in the attack, and pus may track up around the kidney and liver, and so lead to the disease being tardily recognised; but, fortunately, such cases rarely give rise to exceedingly acute symptoms, and the presence of the abscess is sufficiently manifested. It should be opened by a lumbar incision.



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