A contribution to the pathology of the vermiform appendix / by T.N. Kelynack, with illustrations and bibliography.

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A CONTRIBUTION TO

THE PATHOLOGY

OF THE

VERMIFORM APPENDIX.

BY

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WITH ILLUSTRATIONS AND BIBLIOGRAPHY.

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PREFACE.

IN the present volume I have attempted to embody the main results of an extended investigation into a number of points connected with the Pathology of the Cæcal Appendage.

In order to correct and amplify my own clinical and pathological observations I have made frequent reference to the contributions of numerous other writers.

For the ready permission to avail myself of the very exceptional opportunities for carrying out my observations, afforded me by the generous kindness of the Physicians and Surgeons of the Manchester Royal Infirmary, I am unable to sufficiently express my indebtedness.

I am also under deep obligation to Professor Delépine for much kind encouragement. A considerable portion of my work has been carried out in the Pathological Department of The Owens College.

I have also to gratefully acknowledge the kind courtesy of Dr. Rolleston, Mr. Bennett, Mr. Lockwood, Mr. Bland Sutton, Mr. Treves, the Council of the Clinical Society of London, the Editors of the *Journal of Anatomy and Physiology*, the Editors of the *Medical Chronicle*, and Messrs. Fannin & Co., of Dublin, for their kind consent in granting me the use of certain of their illustrations.

To those numerous gentlemen and friends who have most generously furthered my investigations, by sending me specimens or in other ways, I beg to offer my best thanks.

In making myself acquainted with the literature of the subject I have made considerable use of the extensive library of the Manchester Medical Society; and in the compilation of the, I trust fairly complete, Bibliography, I have to thank the Librarian, Mr. Taylor, for much assistance.

MANCHESTER, T. N. KELYNACK.

February, 1893.

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CHAPTER I.

INTRODUCTION.

THE vermiform appendix has been somewhat tersely described[1] as "un organe inutile et nuisible," and Mr. Treves[2] has gone so far as to speak of it as being "obsolete and out of date," and has ventured to state his opinion that "it is safe to predict that, in the intestine of the man of the future, there will be no such structure found hanging from the cæcum." But whatever may be its present service, if it indeed has any, it is undoubtedly the case that in certain morbid conditions it becomes of the greatest pathological importance. And yet, up to within the last few years, but little attention has been drawn to this vestigial structure, and even at the present day comparatively little importance is attached to such a study of its anatomy and pathology as it undoubtedly deserves. Thanks, however, to a number of recent investigators, the frequency and grave consequences of morbid processes affecting this intestinal appendage have been clearly demonstrated. A more extended knowledge of the origin, exact seat, nature, extent, and associations of such lesions of the vermiform appendix, together with certain information as to its normal variability, seems still to be desired, and to such end the following pages are offered as a small contribution.

Previous to the sixteenth century, as Clado[3] has recently pointed out, the vermiform appendix does not appear to have been even recognised.

Bérenger Carpi (1524) seems to have been the first to clearly recognise this little structure. Estienne (1545) also figured it in

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[1] TALAMON: "Appendicite et Pérityphlite," p. 33.

[2] TREVES: "The Surgical Treatment of Typhlitis," p. 14.

[3] CLADO: "Appendice Cæcal; Anatomie, Embryologie, Anatomie Comparée, Bacteriologie Normale et Pathologique." Comp. Rend. Hebdom. de la Soc. de Biologie, 29 Avril, 1892, p. 134.

his work on Human Anatomy, and Vidus Vidius (1561) likened it to a worm, and applied the qualifying term, "vermiform."

During the seventeenth century it is referred to by such anatomists as Bautrin[1] and Philippe Vertreyen.[2]

In the eighteenth century fairly full descriptions of it are given by Santorini[3] and Sabatier.[4]

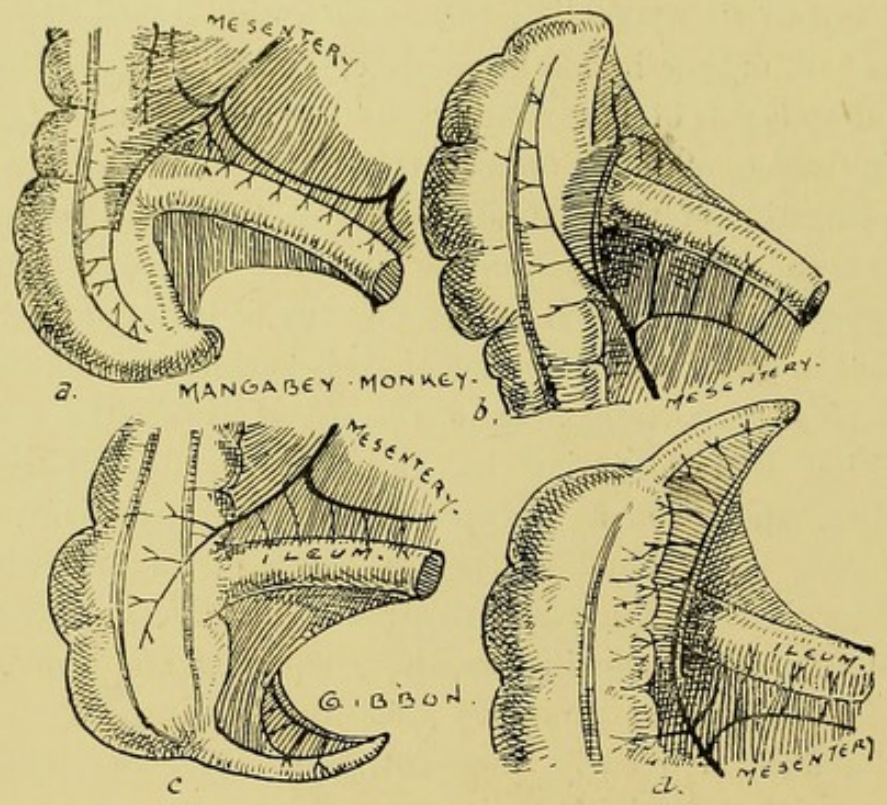

FIG. 1.—Showing the appearance of the cæcum in the Mangabey monkey and Silvery Gibbon. (Treves.) A.—Cæcum of the Mangabey monkey, presenting no distinct vermiform appendix. B. — Posterior view of the same specimen, the cæcum being turned upwards. C.—Quadrilateral shaped cæcum with true vermiform appendix, from the Silvery Gibbon. D.—Posterior view of the same specimen, the cæcum and appendix being turned upwards.

Ihl[5] also, in a dissertation published in 1718, roughly figures the vermiform appendix; and Lieberkühn,[6] in 1739, wrote his dissertation on the ileo-cæcal valve and the cæcal appendix.

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[1] BAUTRIN. "Anatomia corporis humani" (1605).

[2] VERTREYEN. "Anatomia corporis humani" (1693).

[3] SANTORINI. "Observationes Anatomicæ" (1724).

[4] SABATIER. "Traité Complet d'Anatomie" (1791).

[5] IHL (G. C.). "Dissertatio Anatomica de Valvula Coli." Gottingen. 1818.

[6] LIEBERKÜHN (J. N.). "De Valvula Coli et usu processus vermicularis." Gottingen. 1739. Thesis.

During the early part of the present century admirable accounts of its general anatomical characters are recorded in the works of Boyer,[1] Marjolin,[2] and Bichat.[3]

The vermiform appendix is a constant structure in man. This is not so in the higher animals generally. It is said to exist as a distinct process only in the gorilla, chimpanzee,

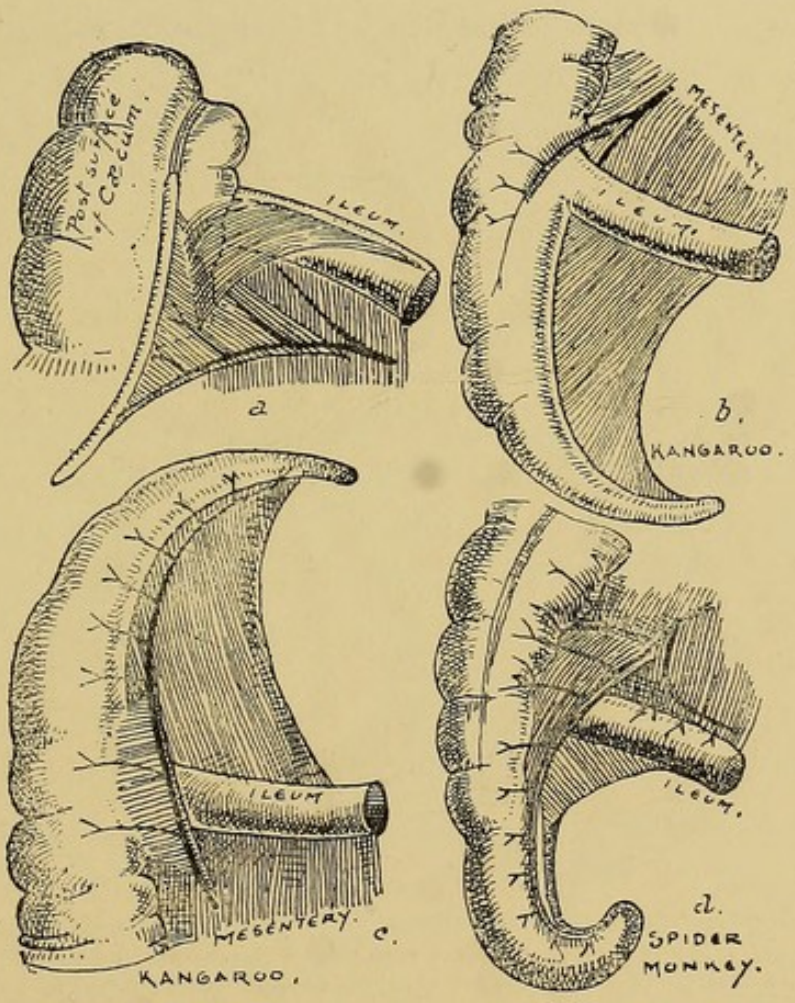

FIG. 2.—Illustrating the differences in appearance between the vermiform appendix of man and the cæci of the kangaroo and the spider monkey (Treves). A.—Vermiform appendix, having well-marked meso-appendix, as met with in man. B.—Long mammalian cæcum, as seen in the kangaroo. C.—Posterior view of previous specimen, showing mesentery with its well defined concave margin, passing from the margin of the ileum to the border of the cæcum which is nearest the small intestine. D.—Elongated tubular cæcum of the spider monkey.

orang, and gibbon among the higher apes; but is uniformly present in the wombat. It would seem that the appendix in man and these animals really represents the lower

[1] BOYER. "Traité d'Anatomie" (1810).

[2] MARJOLIN. "Manuel d'Anatomie" (1815).

[3] BICHAT. "Anatomie descriptive" (1823).

portion of the cæcum, which, in many of the lower vertebrates, is of considerable size. As supporting this opinion, it is interesting to note that the cæcum in the monotremes is also small and worm-like. In the lemuroids it is long and drawn out into a somewhat conical termination.

In some animals the cæcum may bifurcate, as is the case in the manatee. A double cæcum is usually met with in birds.

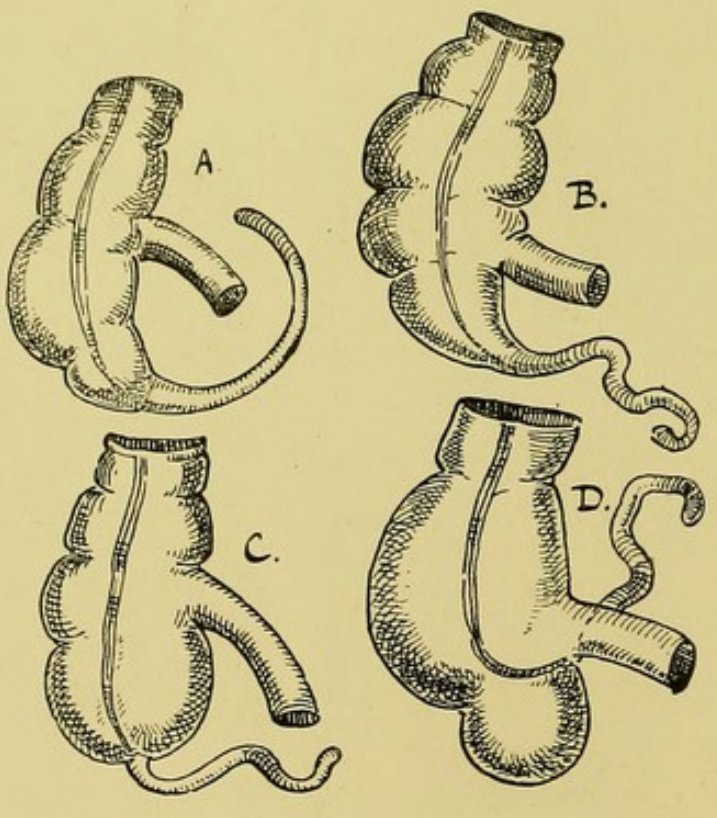

FIG. 3.—Some of the developmental varieties of the cæcum and vermiform appendix, as met with in man (Treves). A.—The typical fœtal cæcum and appendix in man. B.—Cæcum and appendix of fœtal type as occasionally met with in the adult. C.—Quadrilateral shaped cæcum from which the vermiform appendix directly extends. D.—Cæcum having the root of the appendix carried towards the posterior aspect of the caput through undue development of the anterior wall of the cæcum.

It is possible that the few exceptional cases where, in man, the appendix has been stated to be double, may be best explained as a reversion to this ancestral type.

Through the kindness of Mr. Treves I am enabled here to reproduce several of his interesting illustrations, which so well point out certain of the characteristic appearances of the cæcum and its appendix, as met with in some of the higher mammals (Figs. 1, 2, and 3).

Morbid conditions of the appendix in the higher apes are, however, as far as is known, by no means common. Mr. Bland Sutton, who has enjoyed exceptional opportunities for the investigation of such cases, writes me: "In all the specimens of anthropoid apes which have come into my hands for dissection I have always made a point of examining the appendix, and have never succeeded in detecting disease or even concretion." Dr. H. J. Campbell, who has also examined considerable numbers of monkeys from the gardens of the Zoological Society of London, kindly informs me that he has met with no definite example of appendicular disease.

Bochefontaine[1] has recorded a case of "typhlitis" in a monkey, but from his description it would appear that the cæcum was the seat of tubercular ulceration, and the vermiform appendix uninvolved.

As regards the development of the human vermiform appendix, according to Flint,[2] "the cæcum as it develops presents a conical appendage, which is at first as large as the small intestine and is relatively longer than in the adult. During the fourth week this appendage becomes relatively smaller and more or less twisted, and forms the appendix vermiformis."

Clado[3] asserts that by the end of the first two and a half months the appendix is already quite distinct, and as regards its calibre has the same proportion as in the adult.

I have examined a small number of fœtuses, mostly of about the seventh month, and in all, the vermiform appendix has been well-developed and in proportion to the cæcum of very considerable size. In one instance, in a four months' fœtus, it was half an inch in length.

Of all the structures of the body the vermiform appendix is probably the most variable. As giving a fair example of the standard appendix, according to the normal anatomist, the

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[1] Bochefontaine. "Typhlite chez un singe cercopithèque."—*Comp. Rend. Soc. de Biol.*, 1878, p. 302.

[2] Flint. "Human Physiology," 1888, p. 823.

[3] Clado. *Loc. cit.*, p. 158.

following description may be quoted from a well-known text-book of anatomy:—[1]

"The appendix vermiformis is a long, narrow, worm-shaped tube, the rudiment of the lengthened cæcum found in all the mammalia, except some of the higher apes and the wombat, in whom an appendix exists. The appendix varies from 3 to 6 inches in length, its average diameter being about equal to that of a goose quill. It is usually directed upwards and inwards behind the cæcum, coiled upon itself, and terminates in a blunt point, being retained in its position by a fold of peritoneum, which sometimes forms a mesentery for it. Its canal is small, and communicates with the cæcum by an orifice, which is sometimes guarded with an incomplete valve. Its coats are thick, and its mucous lining furnished with a large number of solitary glands."

A somewhat similar description is given in Quain's[2] "Anatomy," where it is described as follows: "Coming off from the inner and back part of the cæcum, at its lower end, is a narrow, round, and tapering portion of the intestine, named the *appendix cæci*, or vermiform appendix. The width of this process is usually about that of a large quill or rather more, and its length varies from 3 to 6 inches, these dimensions differing much in different cases. Its general direction is upwards and inwards behind the cæcum; and after describing a few slight turns it ends in a blunt point. It is retained in its position by a small fold of peritoneum, which forms its mesentery. The cæcal appendix is hollow as far as its extremity; and its cavity communicates with that of the cæcum by a small orifice, sometimes guarded by a valvular fold of mucous membrane."

Darwin,[3] in his "Descent of Man," writes: "It appears as if, in consequence of changed diet or habits, the cæcum had become much shortened in various animals, the vermiform appendix being left as a rudiment of the shortened part. That this appendage is a rudiment we may infer from its small size,

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[1] Gray's "Anatomy," 12th Edition, p. 873.

[2] Quain's "Anatomy," 9th edition, II., p. 614.

[3] Darwin. "The Descent of Man." 2nd edition, 1874, p. 21.

and from the evidence which Professor Canestrine[1] has collected of its variability in man. It is occasionally quite absent, or again is largely developed. The passage is sometimes completely closed for half or two-thirds of its length, with the terminal part consisting of a flattened solid expansion. In the orang this appendage is long and convoluted. In man it arises from the end of the short cæcum, and is commonly from four to five inches in length, being only about the third of an inch in diameter. Not only is it useless, but it is sometimes the cause of death, of which fact I have lately heard two instances; this is due to small hard bodies, such as seeds, entering the passage and causing inflammation."[2]

But, as I intend to show in subsequent pages, the variations of the vermiform appendix in size, shape, length, character of lumen, extent of mesentery, movability, and position are so very considerable, that any pathological considerations which ignore such natural diversities can be of but partial value.

Most of these peculiarities are undoubtedly of developmental origin, but a not inconsiderable number are certainly acquired, and due, in the greater number of instances, to old inflammatory mischief. The task of deciding if such apparent abnormalities are of post-natal origin is frequently far from easy.

If the vermiform appendix has any definite or special function, the physiologist has certainly not as yet clearly indicated it. Some have suggested that its glandular secretion may be of some use in lubricating the adjacent cæcum where the fæces are apt to accumulate.

Thus so recent an author as Habershon[3] states that "the appendix is an elongated gland of a very simple character, resembling the pancreatic cæca of the intestine of the fish, and, as far as is at present known, its secretion is of the character of ordinary mucus." The object of this, he adds, is that "since the fæces here become more solid, were it not for

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[1] Canestrine. "Annuario della Soc. d. Nat." Modena, 1867, p. 94.

[2] M. C. Martin. "De l'Unité Organique."—*Rev. des Deux Mondes.* June 15, 1862, p. 16. Häckel. "General Morphologie." B. II., S. 278.

[3] Habershon. "Diseases of the Abdomen." 4th edition. 1888, p. 406.

such a secretion, assisted by that of the ordinary mucous follicles, adhesion of fæces would be more likely to take place with the parietes, and thus cause distension."

Many of the suggestions of the earlier anatomists are somewhat fanciful. Some looked upon it as a kind of reservoir for such fæcal material as it was imagined might accumulate during intra-uterine life; while others have thought it might furnish some ferment, which would give to the fæces their characteristic consistency, form, and odour.

In several of the fœtuses which I have examined the appendix was certainly very markedly distended with meconium.

The most important pathological conditions of the appendix are undoubtedly inflammatory in character, and it seems most likely that so long as the vermiform appendix has had opportunities of exposure to certain irritants, inflammatory lesions have occurred in man, and yet such affections have been almost completely unrecognised before the present century.

The frequency and importance of inflammatory lesions in connection with the appendix appear to have been first recognised in France. The first recorded case of perforation is that published by Mestivier in 1759. In 1813, Wegeler also recorded an instance of what appears to have been an undoubted example of acute perforative appendicitis. Between the years 1827 and 1868 a number of valuable contributions appeared, the chief being those by Mélier, Louyer-Villermay, Husson and Dance, Ménière, Bodey, Pétrequin, Malespine, Briquet, Bodard, Favre, Forget, Leudet, Barthez, Vidal, Ledantec, Tissier, Hallette, and Blatin.[1]

Amongst English observers it is interesting to note that a Manchester surgeon, the late George Southam,[2] appears to have been one of the earliest to carefully record the condition of chronic suppurative appendicitis. He observed a case in 1835, and published it in 1839-40.

Between the years 1831 and 1868 a number of important cases were recorded by a few English writers, as mentioned below.

[1] Full references to the writings of these authors are given in the Bibliography, at the end of this monograph.

[2] SOUTHAM. *Lancet.* 1839-40, II., p. 565.

In Germany comparatively few early references appear to have been published. The chief communications between the years 1835-1868 are those of Posthuma, Ahrt, Merling, Wilhelmi, Esche, Albers, Hubbauer, Löschner, Meding, Bürger, Volz, Schnürer, Cless, Münchmeyer, and Moers.[1]

In Italy we find as far back as 1835 a communication by Taramelli.[2]

In but few of these early records, however, is a clear recognition of the true pathology of the appendix apparent; and in not a few instances, although the lesions are described with a considerable degree of accuracy, the interpretation of the exact sequence of pathological events is hardly in accordance with modern views.

It is only during the last few years that the vermiform appendix can be said to have attracted any considerable attention as the seat of important pathological processes. Formerly the inflammatory conditions occurring in the right iliac fossa, and variously described under such names as "typhlitis," "peri-typhlitis," "para-typhlitis," "iliac phlegmon," etc., although far from infrequent, were, as regards their origin, but little understood, and many cases of acute peritonitis were followed to their almost invariably fatal termination with no idea that a diseased appendix was the important originating factor.

It is interesting to note that an English physician, Dr. Parkinson,[3] as early as 1812, brought before the Medical and Chirurgical Society of London the record of a case of perforative peritonitis occurring in a boy of about five years of age, with the causal process shown in the preparation of an ulcerated and perforated vermiform appendix, due to the impaction of hardened fæces.

Goldbeck, in his graduation thesis, written in 1830, also notes a case where the appendix was found to be perforated, but he appears to have failed to associate it with the peri-cæcal

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[1] Full references to the writings of these authors are given in the Bibliography, at the end of this monograph.

[2] Taramelli. *Ann. Univ. d'Omodei*, 1835, LXXV., p. 430.

[3] Parkinson. *Med. Chir. Trans.*, 1812, III., p. 57.

inflammatory condition; and Ferrall,[1] in his article on "Phlegmonous Tumours in the Right Iliac Region," published in 1831, although he refers to the condition of gangrenous appendicitis, considers the cæcum by far the most common seat of any primary mischief.

The following year Iliff[2] published notes of a case of appendicitis caused by a raisin stone.

As early as 1834 James Copland[3] distinctly recognised true inflammatory conditions of the appendix as distinguished from those of the cæcum and its surrounding connective tissue.

In the same year, also, Corbett[4] observed a case of peritonitis arising from impaction of a small calculus in the vermiform appendix.

Much praise is due to Burne,[5] who, in 1837, and again in 1839, clearly pointed out the important differences between the inflammatory conditions of the appendix and those of the cæcum, and recorded a number of cases. He also introduced the term *tuphlo-enteritis*.

Albers, in 1838,[6] also clearly indicated differences in the onset, progress, and general characters of "typhlitis" and "peri-typhlitis," but he appears to have considered the appendix far less prone to be involved than the cæcum. He, too, also recognised the fact that the appendix was found sometimes to communicate with the surrounding abscess cavity, but seems not to have appreciated its importance, but rather to have considered it as quite secondary.

In 1839, Kowacz[7] wrote his thesis on perforative ulceration of the vermiform appendix.

Lees,[8] in 1842, before the Pathological Society of Dublin,

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[1] Ferrall. *Edin. Med. and Surg. Jour.*, July, 1831, p. 1.

[2] Iliff. *Lond. Med. and Surg. Jour.*, I., 1832., p. 214.

[3] Copland (James). "Dictionary of Practical Medicine," I., p. 277.

[4] Corbett. *Dublin Med. Press*, 1840, IV., p. 65.

[5] Burne. *Med. Chir. Trans.*, 1837, XX., 219. *Ibid*, 1839, XXII., p. 33.

[6] Albers. "Beobachtungen auf dem Gebiete der Path. und path. Anat." Bonn. 2ter Theil, 1838.

[7] Kowacz. "Peritonitis, ulcus processus vermiformi; perforatio." Prag., 1839, Thesis.

[8] Lees. *Dublin Jour. Med. Sci.*, 1843, XXIV., p. 278.

showed an appendix from a child of fifteen months, where there was a large perforating ulcer.

The following year typical examples of perforative appendicitis were recorded by Butler,[1] and also by Peebles[2]; and in 1845 a further case was recorded by Bury.[3] In the same year, Pepper[4] also recorded a case of perforative appendicitis occurring in a woman of 45, and caused apparently by the impaction of a grape seed.

In 1848, Mr. Dumville,[5] at a meeting of the Manchester Pathological Society, showed a specimen of sloughing ulcer of the vermiform appendage, obtained from a man of 24, who died with the characteristic symptoms of perforative peritonitis. Mr. Dumville also stated that four years previously he had met with a somewhat similar case, occurring in a strong healthy woman.

In the same year Prescott Hewett[6] recorded a remarkable case of ulceration of the appendix, due to a nail-shaped concretion, the nucleus of which proved to be a pin.

In 1855 examples of perforative appendicitis were brought before the Pathological Society of London by Wilks[7] and also by Ward.[8]

A most important advance was made shortly after by Oppolzer,[9] who, in 1858, clearly pointed out the important fact that the "iliac phlegmon" might be divided into two great groups—(1) intra- and (2) extra-peritoneal. For the latter class he suggested the term "*para-typhlitis.*"

In 1859, Crisp[10] brought before the Pathological Society of London, a further example of perforation of the appendix; and in 1861, before the same society, Nunneley[11] and

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[1] Butler. *Prov. Med. Jour.*, 1843. V., p. 507.

[2] Peebles. *Amer. Jour. Med. Sci.*, 1843. N.S. V., p. 122.

[3] Bury. *Prov. Med. and Surg. Jour.*, 1845, p. 603.

[4] Pepper. *Trans. Coll. Phys. Philad.*, 1841-46, p. 296.

[5] Dumville. *Lond. Med. Gaz.*, 1848, p. 341.

[6] Hewett. *Rep. Proc. Path. Soc., London*, 1848-49, p. 58.

[7] Wilks. *Trans. Path. Soc. Lond.*, 1855-56, VII., p. 210.

[8] Ward. *Trans. Path. Soc. Lond.*, 1855, p. 197.

[9] Oppolzer. *Allg. Wiener med. Zeitung*, 1858, XX., p. 81; XXI., p. 86.

[10] Crisp. *Trans. Path. Soc. Lond*, X., p. 151.

[11] Nunneley. "Disease of the Appendix Vermiformis, with a small aperture in it, and Acute Peritonitis." *Trans. Path. Soc. Lond.*, XIII., 1861, p. 72.

Peacock[1] mentioned cases. Langdon Down,[2] in 1867, and Farquharson[3] in 1868, also published further typical examples of perforative appendicitis.

In 1870, Fergus[4] recorded a case; and in 1872 Theodore Williams[5] noted a case of perforation of the appendix, with the formation of a localised intra-peritoneal abscess.

Since this time a considerable number of cases of appendicular disease have been recorded, but it is only within the last few years that anything like a clear knowledge of the pathology of so-called "peri-cæcal" inflammations has been obtained, and an appreciation of the fact that the appendix is usually the initial seat of the mischief.

Much of our present knowledge is due to the enthusiastic researches of Trans-Atlantic observers, such as Parker, Sands, Senn, Morton, Mynter, McBurney, Weir, Myer, Fitz, Bull, Briddon, Stimson, and a host of other American physicians and surgeons.[6]

In England, Treves has most prominently brought the subject forward; and in France Talamon and others have recently clearly indicated the extent and importance of appendicular disease.

Modern interest in the welfare of the appendix is also clearly indicated by the prominent position given to a consideration of the morbid conditions of the appendix by leading medical societies.

Thus important discussions have recently taken place in England, at the British Medical Association,[7] and the Clinical

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[1] Peacock. "Ulceration of the Appendix Vermiformis and Abscess in the Cellular Tissue." *Trans. Path. Soc. Lond.*, XVIII., 1867, p. 87.

[2] Langdon Down. "Ulceration of the Appendix Vermiformis." *Trans. Path. Soc. Lond.*, XVIII., 1867, p. 97.

[3] Farquharson. *Edin. Med. Jour.*, June, 1868.

[4] Fergus. "Perforation of the Vermiform Process of the Cæcum from Concretion; General Peritonitis, death on the fourth day." *Trans. Path. Soc. Lond.*, XXI., 1870, p. 179.

[5] Theodore Williams. "Ulceration of the Vermiform Appendix, giving rise to Limited Peritonitis." *Trans. Path. Soc. Lond.*, XXIII., 1872, p. 106.

[6] Full reference to the writings of these and other American authors are given in the Bibliography at the end of this monograph.

[7] *Brit. Med. Jour.*, 1889, II., pp. 10, 30.

Society of London[1]; in Ireland, before the Royal Academy of Medicine;[2] in America, at the New York Surgical Society,[3] the New York Clinical Society,[4] the New York Academy of Medicine,[5] the New York State Medical Association,[6] the Medico-Chirurgical Society of Montreal,[7] the Massachusetts Society,[8] and numerous smaller societies. In France the subject has been brought before the notice of the Société de Chirurgie de Paris.[9] In Australia also, the Medical Society of Victoria[10] has held an important conference on the subject.

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[1] *Medical Press and Circular*, Feb. 18, 1891; also *Brit. Med. Jour.*, 1891, I., pp. 410, 523; also *Lancet*, 1891, I., pp. 432, 545.

[2] *Dub. Jour. Med. Sci.*, 1892, XCIV., p. 172.

[3] *New York Med. Jour.*, Feb. 25, 1888; March 30, 1889; Dec. 21, 1889; Feb. 1 and May 24, 1890; July 4, 1891; May 28, 1892.

[4] *New York Med. Jour.*, Feb. 22, 1890.

[5] *Med. Record*, 1892, I., p. 469; and II., p. 629.

[6] *New York Med. Jour.*, Nov. 26, 1892.

[7] *New York Med. Jour.*, Jan. 18, 1890.

[8] *Boston Med. and Surg. Jour.*, July 9, 16, 23, 1891.

[9] *Bull. et Mém. Soc. de Chir. de Paris*, 1890, N.S., XVI., p. 636; and *Revue de Chirurgie*, 10 Juillet, 1892, p. 633.

[10] *Australian Medical Journal*, June, 1891.

CHAPTER II.

THE VERMIFORM APPENDIX.—VARIATIONS IN LENGTH.

ONE of the most important variations in the vermiform appendix is as regards its length. Upon this, in great part, depends the possibility of many of its malpositions; and since its lumen is usually, as I shall show later, patent in its greater part, it necessarily follows that the longer the tube the greater likelihood for the accumulation and retention of fæcal matter and the formation of concretions or irritating masses of excreta. Thus the seemingly trifling variations in the length may be at least of some importance as factors in the ætiology of certain forms of appendicitis.

The length of the appendix of the adult is stated by Sands to be from three to five inches, but he also notes that it has been found as short as one inch and as long as nine inches. Treves[1] gives the average length as four inches, the extremes being one inch and six inches. Ferguson,[2] from an examination of 200 appendices, finds the average length to be four and a half inches. In three cases it was only half an inch in length. Fitz[3] states the longest appendix he has met with was "nearly six inches." Mott,[4] however, records a case where the appendix measured seven inches. It turned up behind the cæcum and mesocolon, crossed the second part of the duodenum,

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[1] TREVES. "The Surgical Treatment of Typhlitis," 1890, p. 11.

[2] FERGUSON. *International Journal of Medical Science*, January, 1891.

[3] FITZ. *Transactions of the Association of American Physicians*, 1886, I., p. 110.

[4] MOTT. *Transactions of the Pathological Society, London*, XL., 1859, p. 106.

and was firmly attached to the right kidney by its tip. Wister[1] mentions a case where the appendix was no less than nine inches long. This is the longest appendix on record.

Complete absence of the appendix has been recorded by Ferguson and others. Even Treves[2] says "It is quite common to find in *post-mortem* subjects that the vermiform process is wanting."

Operating surgeons have also been known to fail to discover the appendix, and have closed the abdomen with the belief that it was absent. I have, however, myself never met with any case where the appendix could be said to be absent, except as the result of disease. In a few instances the cæcum and appendix have certainly been so involved either by sarcomatous growth, or by old inflammatory adhesions, that it has been impossible to isolate any appendicular structure. Frequently, where one has at first failed to detect it, careful search has revealed it tucked behind the cæcum, or hidden beneath the ileum. Occasionally it has been stowed away within a peri-cæcal pouch.

In going through my notes of appendices examined in over 200 cases, I find that careful measurements have been made and recorded in 177. In many other instances the length has been merely stated as "long" or "short," and in a considerable number the appendix was so surrounded by old adhesions, or involved by growth, that its length could not be taken. The measurements of specimens sent me by friends are of course not included in this return; neither have I here included the length of the appendix as found in the various fœtuses examined. The measurements given were all made in the Post-mortem Theatre of the Manchester Royal Infirmary, on the appendices of patients who died in that institution. The average length proved to be $3\frac{1}{2}$ inches. There was, however, considerable variety, as may be best recognised from the following table:—

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[1] Wister. *Trans. College of Physicians, Philadelphia*, 1856-62, N. S., III., p. 147.

[2] Treves. *Loc. cit.*, p. 14.

VARIATIONS IN LENGTH OF THE VERMIFORM APPENDIX.

Length.	No. of Cases.	Per centage.[1]
Up to 1 inch	2	1
Between 1 and 2 inches	17	9½
„ 2 „ 3 „	54	30½
„ 3 „ 4 „	61	34½
„ 4 „ 5 „	31	17½
„ 5 „ 6 „	12	6½

So far as I am aware, no definite information has been published as to whether variation in length is dependent upon difference of sex or variation in age.

In order to obtain such statistical results I have classified my cases, and the results may be best seen from the following tables :—

I.—VARIATIONS IN LENGTH AS REGARDS SEX :—

Sex.	Number of cases recorded.	Average length (inches.)
MALE	118	3·49
FEMALE	59	3·53
TOTAL	177	3·51

II.—VARIATIONS IN LENGTH AS REGARDS AGE :—

(A.) Males.

Age.	Number of cases recorded.	Average length (inches.)
Under 10 years	5	2
10 to 20	9	3½
20 „ 30	11	4
30 „ 40	28	3½
40 „ 50	23	3
50 „ 60	25	3¾
60 „ 70	15	3
70 „ 80	2	3
Total	118	3

II.—VARIATIONS IN LENGTH AS REGARDS AGE :—

(B.) Females.

Age.	Number of cases recorded.	Average length (inches.)
Under 10 years	1	3
10 to 20	6	4
20 „ 30	12	4
30 „ 40	12	3
40 „ 50	17	3¾
50 „ 60	8	3
60 „ 70	1	2½
Total	57	3

[1] In giving the per centage, for the convenience of comparison, I have neglected small fractional parts.

From the above returns it will be seen that, as far as can be ascertained, differences in length can hardly be said to depend upon any uniform difference in sex or age; neither has, I believe, height of body or variations in size of cæcum or length of intestine any marked influence.

At an advanced stage of intra-uterine life the appendix is usually of considerable size. On two occasions I have met with an appendix in the fœtus, as long as 2 inches. In one of these it was much coiled upon itself, and in the other it was distended with meconium. Even in a four months' fœtus I have found the appendix as long as half an inch, which in proportion to the rest of the intestines is a very considerable length.

CHAPTER III.

THE VERMIFORM APPENDIX—VARIATIONS IN LUMEN.

THE vermiform appendix is certainly to be regarded as a tubular structure, and much interest arises as to the degree and extent of its patency.

The appendico-cæcal aperture, which is usually found at the posterior and inner portion of the cæcum, has been described as possessing a valve-like projection of mucous membrane, often spoken of as Gerlach's[1] valve, and it has been suggested that it may be of importance in causing retention of fæcal or foreign materials. I have carefully examined a large number of cases as to this point; but, while freely admitting that part of the mucous membrane around the appendicular orifice is often somewhat lax or prominent as a slight ridge, I have been unable to satisfy myself that there was any structure worthy of the designation of valve, or likely to act as such. Clado[2] also states that he has never found any valve such as described by some authors.

What is of far greater importance than any imaginary valve is the true size of the orifice. This frequently varies from a mere pin-hole opening to that sufficient to admit of a No. 7 catheter (English scale).

Variations in the size of the appendico-cæcal aperture are undoubtedly of considerable importance. Probably, contrary to what is usually imagined, a small aperture is less to be desired than a large one. For while a small opening readily admits semi-fluid fæcal matter, it hinders or prevents the egress of semi-solid or hard material. Under such circumstances certain forms of habitual constipation may be of considerable importance

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[1] GERLACH. *Zeitsch. f. rat. Med.*, 1847, VI., 12.

[2] CLADO. *Comp. Rend. Heb. Soc. de Biol.*, 29 April, 1892, p. 140.

in setting up and perpetuating a stagnation within the appendix.

In only three cases have I found complete obliteration of the appendicular aperture. In the first,[1] that of a middle-aged female, the appendix was converted into a distinct cyst. In the second case,[2] which was met with in an old man, although there was a distinct depression at the usual point of the appendicular orifice, there was no aperture, and the whole of the appendix was converted into a fibrous cord. In the third,[3] occurring in a man dying from chronic interstitial nephritis, the appendix was free, but converted into a firm fibrous cord with its cæcal aperture merely indicated by a slight dimple.

As regards the degree of perviousness of the appendicular canal, few observations have been recorded. The general opinion appears to be that the lumen is frequently non-patent either in part or throughout, and that in such cases the obliterated portion is converted into a fibrous cord. Thus Fitz[4] writes: "Complete or partial obliterations of the canal are frequent." Such has certainly not been my experience, and I have paid particular attention to this point. It has long been my custom to slit up the appendix, and in far the majority of cases I have found it patent throughout.

The only observers who have published the results of any extensive investigation on the perviousness of the appendix are Lockwood and Rolleston, who, in an examination of 104 cases, have found the lumen of the appendix in 7 instances obliterated, although the appendix was perfectly free and movable, and apparently otherwise quite normal. Of these seven cases, 4 were males and 3 females. These authors also state that "the appendix is frequently found partially impervious in old people, often for its distal third or half."

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[1] *Manchester Royal Infirmary Post-mortem Reports*—Medical. Vol. 1891, p. 32, No. 11.

[2] *Manchester Royal Infirmary Post-mortem Reports*—Medical. Vol. 1891, No. 232.

[3] *Manchester Royal Infirmary Post-mortem Reports*—Medical. Vol. 1893, p. 86, No. 27.

[4] Fitz.—*Trans. Assoc. Amer. Physic.*, I., p. 111.

The result of my own observations on the patency of the appendicular canal is given in the following table:—

Sex.	No. of Cases	Pervious throughout.	Pervious in part.	Completely obliterated
Male.....	65	48	14	2
Female.....	33	26	7	—
Total.....	98	74	21	2

As regards the cases grouped as "pervious in part" further explanation may be desirable. In many cases the only portion of the canal which appeared obliterated was situated quite at its tip. Sometimes this was not for more than half an inch, but occasionally as much as the last inch would be converted into a fibrous cord.

In connection with this question of perviousness of the vermiform appendix, Dr. Rolleston, Pathologist to St. George's Hospital, London, has most generously placed at my disposal the valuable notes of his unpublished records as to the so-called normal variations of the appendix, based upon an examination of over 200 cases. His results, in respect to the point in question, I have arranged in the following table:—

Sex.	No. of cases.	Pervious, and free.	Pervious, and fixed.	Partial obliteration, but free.	Partial obliteration, but fixed.	Completely obliterated, but free.	Completely obliterated, but fixed.
Males.....	139	104	21	7	6	1	—
Females ..	74	46	11	2	2	2	1
Total	213	150	33	9	8	3	1

As regards the actual size of the cavity of the appendix, I have met with great variety. Sometimes, as above stated, it is exceedingly small, admitting only a fine probe; while more frequently it is of sufficient size to contain an ordinary quill. A catheter scale is most convenient for estimating the size of the appendix and the diameter of its lumen. An ordinary graduated iris diaphragm is also serviceable.

The size of the appendix is, however, no guide to the extent or diameter of its interior, for its walls vary immensely in thickness.

It has been said[1] that the appendix is large in infants and small in the aged. It is doubtful, however, if this is not somewhat too sweeping a statement. Certainly my own experience has not led me to form such a decided opinion.

[1] Jacobi. *New York Medical Journal*, April 2, 1892, p. 385.

CHAPTER IV.

PERI-CÆCAL PERITONEAL FOSSÆ.

ANY account of the anatomy and pathology of the vermiform appendix would be far from complete unless due reference were made to the several peritoneal pouches met with in the neighbourhood of the cæcum, and usually spoken of as peri-cæcal fossæ.

These pouches are of considerable importance as regards the position of the appendix, for in a number of cases it has been known to become herniated within certain of them.

These fossæ, however, are undoubtedly exceedingly variable, and much difference of opinion still exists as to their character and frequency of occurrence. Leichtenstern,[1] although he names them, goes so far as to think that they are so very variable as to prevent the adoption of any uniform nomenclature which would be of any practical service. They have, nevertheless, received some attention from such observers as Luschka,[2] Hartmann, Treitz, Waldeyer, Jonnesco,[3] Tuffier[4], Treves,[5] and Lockwood[6]; while, quite recently, Lockwood and Rolleston,[7] in a communication to the Anatomical Society of Great Britain and Ireland, have recorded the results of a most valuable series of careful observations on a large number of bodies. Through the kind courtesy of these authors I am enabled to

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[1] LEICHTENSTERN. *Ziemssen's Cyclop. Pract. Med.*, 1877, VII., p. 549.

[2] LUSCHKA. "Ueber die Peritoneale umhüllung des Blinddarmes und ueber die Fossa Ileo-Cæcalis." *Virchow's Archiv für Path. Anatomie*, XXI., pp. 285-288.

[3] JONNESCO. "Hernies Internes Rétro-Peritonéales." Paris, 1890.

[4] TUFFIER. "Étude sur le Cæcum."—*Archiv. Gén. de Méd.*, 1887, p. 652.

[5] TREVES. Lectures on the Anatomy of the Intestinal Canal and Peritoneum in Man.—*British Medical Journal*, March 14, 1885, p. 528.

[6] LOCKWOOD. Hunterian Lectures on Hernia, 1889.

[7] LOCKWOOD AND ROLLESTON. "On the Fossæ around the Cæcum, and the Position of the Vermiform Appendix, with special reference to Retro-Peritoneal Hernia." —*Journal Anat. and Phys.*, XXVI., p. 130.

here reproduce their admirable illustrations, which so much facilitate a clear conception of the results of their investigation.

From my own researches on a very large number of bodies during the past two years I can, in the main, confirm the conclusions of Dr. Rolleston and Mr. Lockwood. Their nomenclature is also so convenient, while enforcing the chief anatomical features which may be of practical importance, that I here and in subsequent descriptions follow it.

The following fossæ may be considered more or less constant:—

(1) *The Ileo-colic Fossa.*—This peritoneal pouch is formed at the angle produced by the junction of the ileum and colon. The floor is formed by the mesentery, and sometimes by a portion of the ileum, and in the fold of peritoneum (ileo-colic fold) forming its roof, a branch (arteria ileo-cæcalis anterior) of the ileo-colic artery passes to the front part of the cæcum, crossing the ileum.

The ileo-colic fold has received various names. Jonnesco speaks of it as the "mesenterico-cæcal fold"; while Treves and Tuffier name it the "superior ileo-cæcal fold."

The ileo-colic fossa is also known by other names. Jonnesco simply terms it the "ileo-cæcal"; while Waldeyer, Hartmann, Tuffier, and Treves call it the "superior ileo-cæcal fossa."

It is always small, but I have met with several instances where it was particularly distinct. Often, however, there is no distinct pouch. Treves states that the largest pouch he has met with in this situation only took the point of the thumb to a depth sufficient to cover the nail. This pouch is shown in Fig. 4.

(2) *The Ileo-cæcal Fossa.*—This fossa is situated behind the angle of junction of the ileum and cæcum, and extends for a varying distance upwards behind the ileo-colic junction, and parallel to the ascending colon. At its right boundary is the mesentery of the ascending colon, while on its left lies the mesentery proper. Sometimes it extends half-way up the ascending colon, and ends close to the kidney and duodenum.

When an appendix lying in such a fossa suppurates, it may readily be mistaken for a nephritic or lumbar abscess.

The origin of this fossa is of considerable interest, and is thus described by Lockwood and Rolleston[1]:—

"The ileo-cæcal fossa is developed during the descent of the cæcum and end of the ileum into the iliac fossa. The cæcum is at one time situated beneath the liver, and, together with the

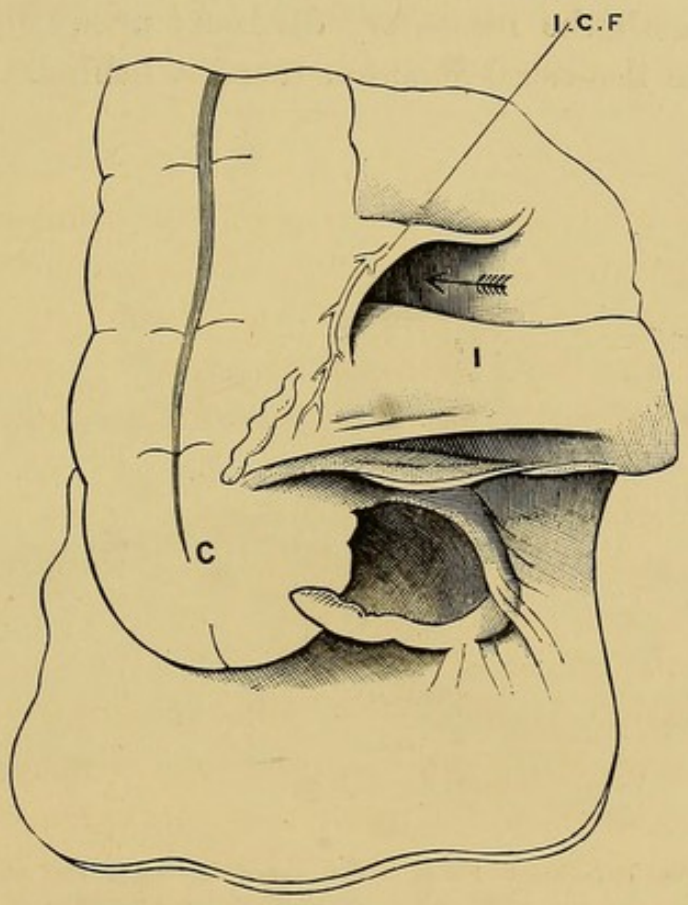

Fig. 4.—To illustrate the form and situation of the Ileo-Colic Fossa. An arrow indicates the entrance to this peritoneal pouch. (Lockwood and Rolleston.)—C. Cæcum. I. Ileum. I.C.F. Ileo-colic fold, with anterior ileo-colic artery, passing along it to the front part of the cæcum.

colon, is carried upon the same mesentery as the rest of the intestines. From its high position the cæcum, together with the end of the ileum, the mesentery, and vermiform appendix, descends into the iliac fossa, its progress being assisted by the gubernaculum.

"The gubernaculum does this by means of an accessory

[1] Lockwood and Rolleston. *Loc. cit.*, p. 135.

band of muscular fibres, which it sends upwards beyond the ovary or testis in the plica vascularis. The latter fold is the upper part of the mesorectum or mesovarium, and has been described under the name of plica vascularis, because it contains the spermatic or ovarian vessels.

"The plica vascularis ends above upon either the vermiform appendix, the mesentery, the cæcum, or ileum. As it assists in pulling those organs towards the iliac fossa, the peritoneum beneath the mesentery descends unequally, and the part near the ileo-cæcal junction remains behind. Hence, by

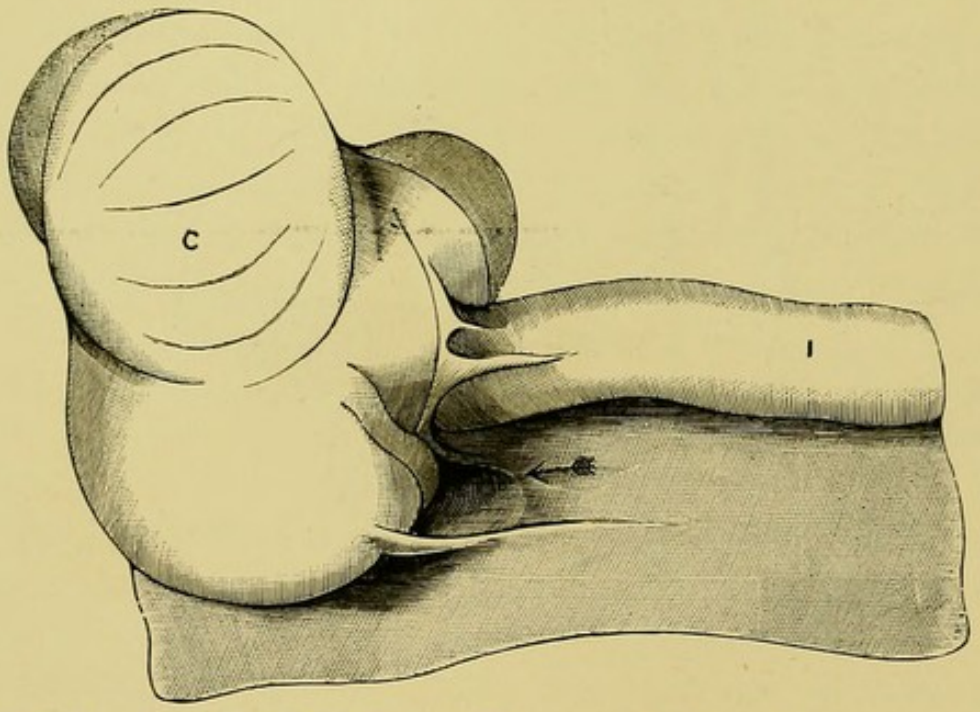

Fig. 5.—The Ileo-Cæcal Fossa. The arrow indicates the entrance to this peritoneal pouch. In the illustration the vermiform appendix is represented as herniated into this ileo-cœcal fossa. (Lockwood and Rolleston.) C. Cæcum. I. Ileum.

the time the cæcum and right colon have assumed their permanent position, a recess has been created, which is the ileo-cæcal fossa. Another factor in the process is the substitution of the permanent ascending meso-colon for the original one, which, as we have already said, is part of the mesentery. The reason for the incomplete descent of the peritoneum which forms the ileo-cæcal fossa is obscure.

"The explanation, probably, turns upon the action of the blood vessels and suspensory muscle of the mesentery in

restraining the movements of the peritoneum at the angle between the ileum and colon, this being the portion of serous membrane which, by its occasional incomplete descent, forms the ileo-cæcal fossa."

The form and situation of this fossa is shown in Fig. 5.

The ileo-cæcal fossa is sometimes divided into two parts by the *meso-appendix,* thus forming (a) the *superior* and (b) the *inferior ileo-cæcal fossæ.*

This condition is well shown in Fig. 6, where the mesentery

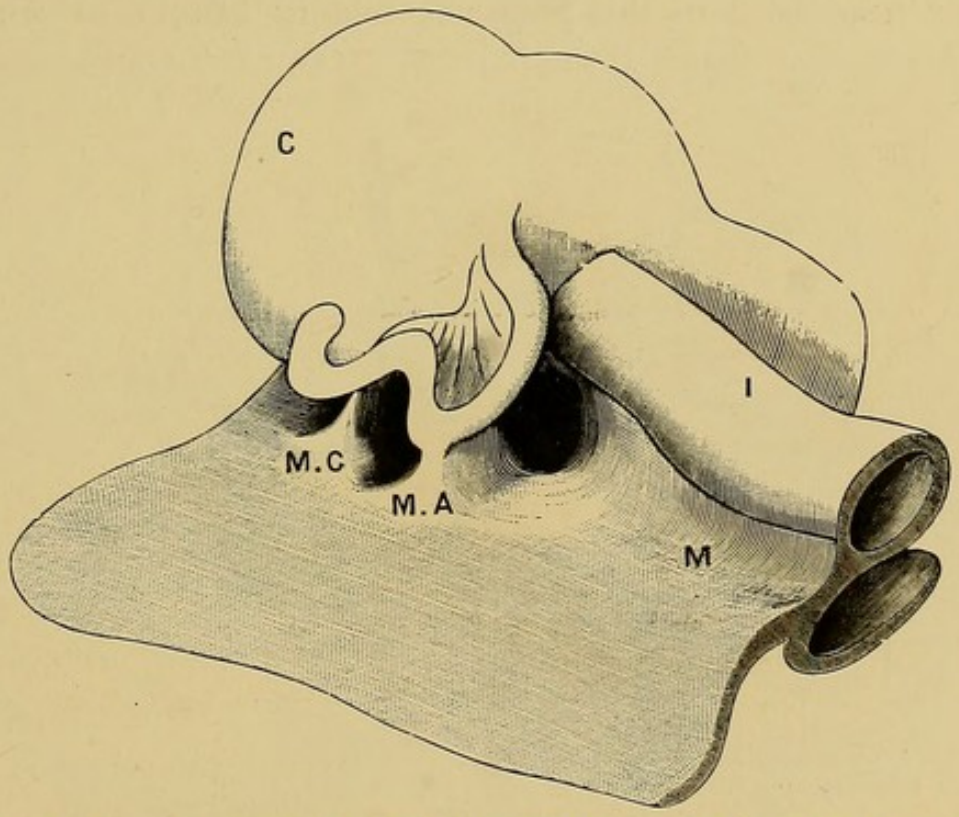

Fig. 6.—The Superior and Inferior Ileo-Cæcal Fossæ. (Lockwood and Rolleston.)
C. Cæcum. I. Ileum. M. Mesentery. M.A. Meso-appendix. M.C. Meso-cæcum.

of the appendix is not only attached to the floor of the ileo-cæcal fossa, but runs up a little way on to the cæcum.

A further peritoneal fold—*the ileo-cæcal*—is frequently met with, situated usually at about the ileo-cæcal angle. In some instances it is of a triangular shape, having its apex at the ileo-cæcal junction and its base free as a crescentic border bounding the mouth of the superior ileo-cæcal fossa. The superior side is attached to the ileum, while its lower blends with the meso-cæcum and peritoneal coat of the cæcum.

Treves speaks of it as "*the bloodless fold*," and looks upon it as the true mesentery of the cæcum.

It is interesting to note that this fold appears to have been first clearly recognised and accurately described in 1871 by the late Dr. T. E. Little,[1] before the Pathological Society of Dublin, for in the Society's Report I find that Dr. Little, after drawing attention to the fact that "the appendix can be seen to be connected by a double fold of serous membrane (its mesentery) to the under surface of the mesentery of the ileum," goes on to say that "in addition to this proper mesentery, in all cases where disease has not distorted the parts, there will be found a second

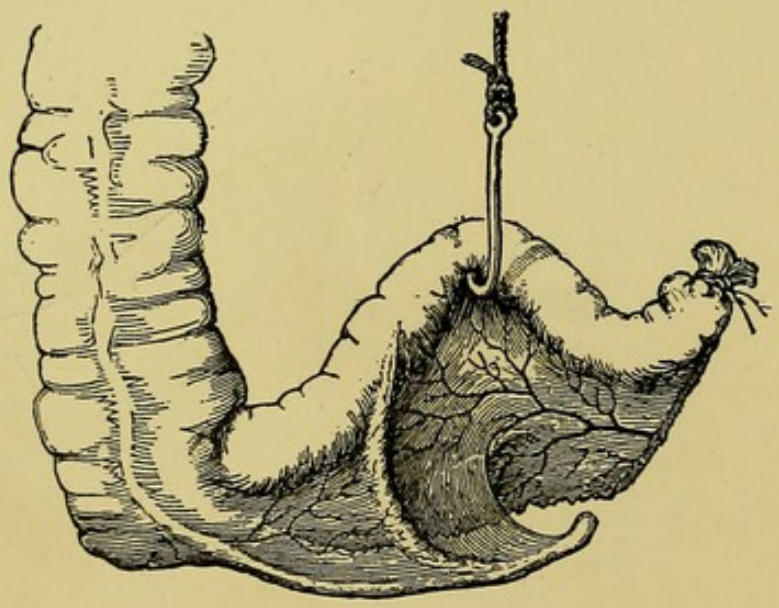

Fig. 7.—Showing well-marked Peritoneal Fold (the ileo-cæcal), termed by the late Dr. Little the "ileo-cæcal omentum." (After Little.)

duplication of the peritoneum passing from the upper edge of the appendix to the inferior and anterior surface of the ileum at its termination, having a free concave margin looking towards the left side, and extending on the latter organ for a distance of about two inches from its termination." "This peritoneal fold," he adds, "is quite distinct from the mesentery of the appendix, a well-marked peritoneal *cul-de-sac* lying between them; and it generally contains between its serous layers a small mass of molecular fat, and one or two small vessels,

[1] Little. *The Dublin Quarterly Journal Med. Sci.*, 1871, LII., p. 239.

giving it a general structural resemblance to the great omentum. It might, in fact, be termed the *ileo-cæcal omentum.*"

Through the kindness of the late Dr. Little's executor, I am enabled to reproduce his original illustration. (Fig. 7.)

The various peritoneal folds about the cæcum are somewhat diagrammatically represented in Fig. 8.

(3) *The Sub-cæcal Fossa* is situated immediately beneath the cæcum, which has usually to be raised to bring it into view.

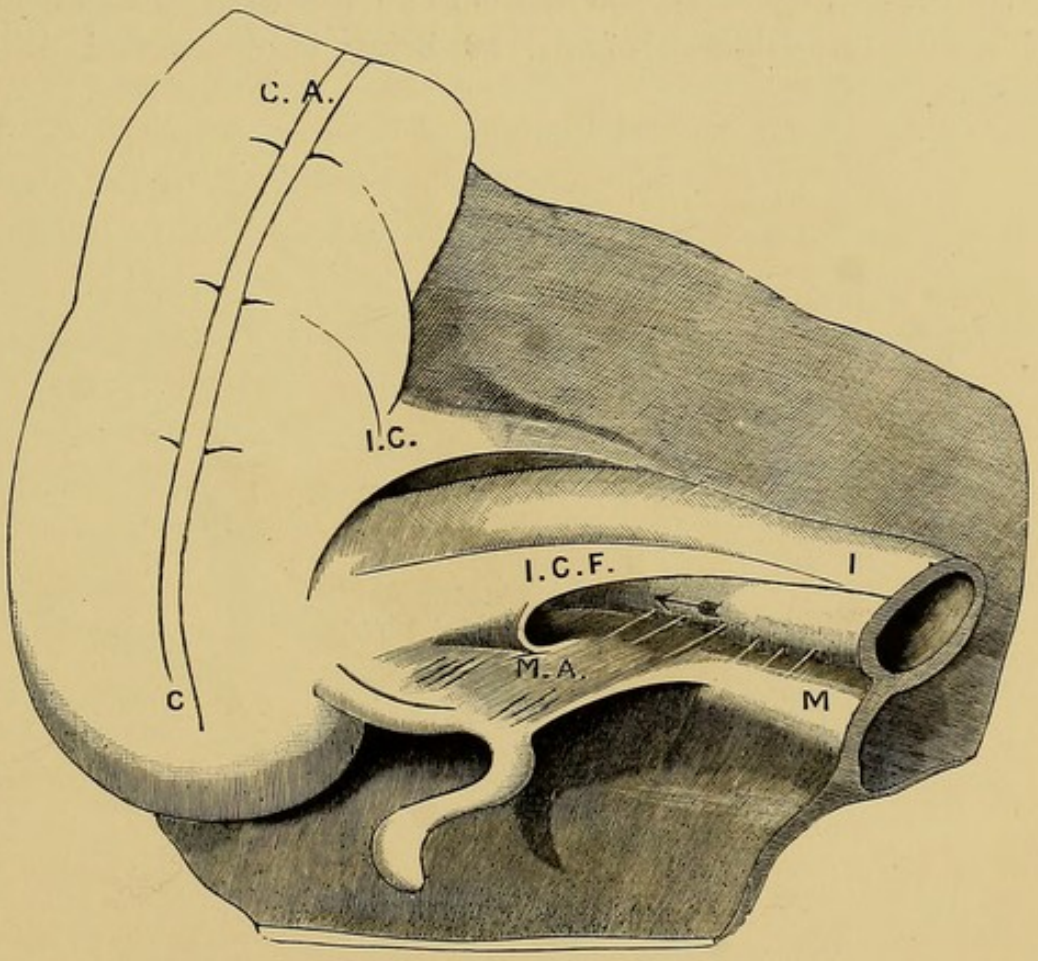

Fig. 8.—The Peritoneal Folds about the Cæcum. (Lockwood and Rolleston.) C.—Cæcum. C.A.—Ascending colon. I.—Ileum. I.C.F.—Ileo-colic fold. M.—Mesentery of Ileum. M.A.—Mesentery of the Vermiform Appendix. The arrow indicates the Superior ileo-cæcal fossa.

It lies close to the ileo-cæcal fossa, being divided from it by the left side of the meso-cæcum and ascending meso-colon. Its mouth is generally at the junction of the cæcum and colon, and it opens out the layers of the meso-cæcum or meso-colon. It is not so frequently met with as the previously mentioned

pouches. Treves, indeed, goes so far as to say, "one little fossa, termed indiscriminately the fossa cæcalis infima, the fossa sub-cæcalis, and the recessus retro-appendicularis, I have entirely failed to discover."

I have, however, met with a few instances where a sub-cæcal pouch was present, and have even found the tip of the appendix inserted within it.

In the unpublished notes of the 217 cases kindly sent me by Dr. Rolleston, there are references to no less than 17 instances of a distinct sub-cæcal fossa, 13 being in males and 4 in females.

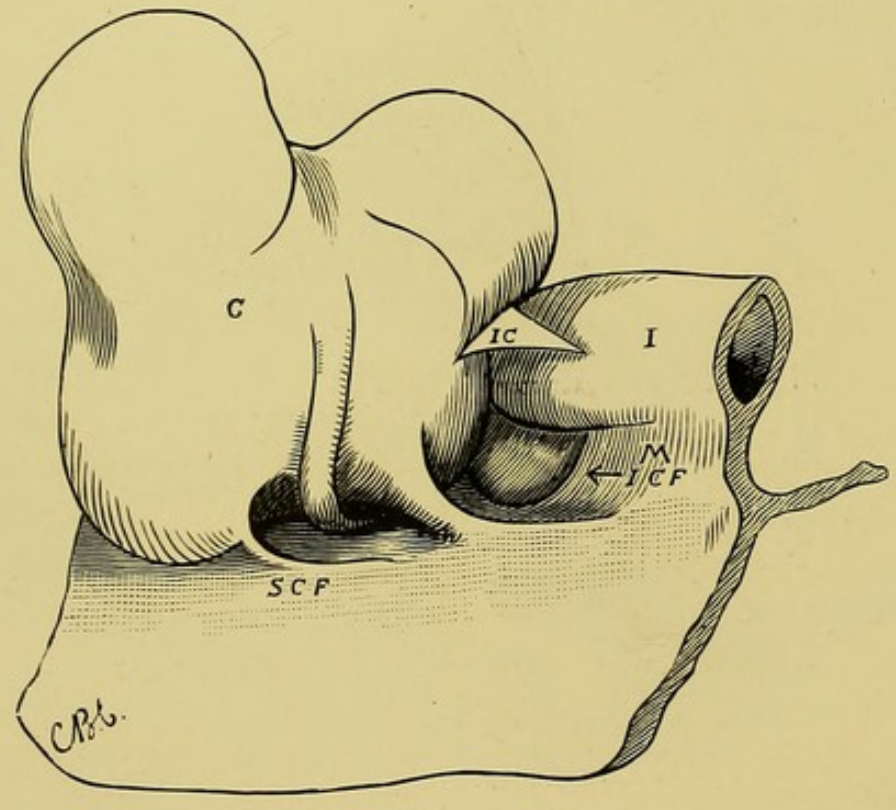

Fig. 9.—Sub-cæcal Fossa, showing a Hernia of the Vermiform Appendix into it (Lockwood and Rolleston.) C.—Cæcum. I.—Ileum. I.C.—Ileo-cæcal fold. M.—Mesentery of the Ileum. I.C.F.—Ileo-cæcal fossa; arrow pointing into the fossa. S.C.F.—Sub-cæcal fossa.

In many cases this sub-cæcal fossa is little more than a mere peritoneal dimple.

The usual form and situation of a well-marked sub-cæcal pouch is shown in Fig. 9. In this illustration the appendix is epic ted as herniated within the fossa.

In connection with these peritoneal folds brief reference may be made to the *meso-appendix*, or mesentery of the vermiform appendix. This structure is almost invariably present, although subject to considerable variation in length, thickness, and extent of attachment. It consists of a double fold of serous membrane, and usually arises from the lower layer of the true iliac mesentery. To the right it blends with the peritoneum covering the cæcum, at the angle formed by the junction of the ileum with the cæcum. To the left it most commonly has a distinct free border. Between its layers run vessels, lymphatics, and a few nerve fibres. In a number of cases I have found it extensively infiltrated with fat; sometimes to such an extent as to form distinct *appendices epiploicæ*.

Lockwood and Rolleston state that "the meso-appendix seldom reaches more than half or two-thirds of the way along the appendix, and usually gives the impression of being too short, as to cause the appendix to coil upon itself."

Treves also remarks that "in the fœtus it may extend to the tip of the appendix, but in the adult it often only reaches to the centre of the tube or to the junction of its middle with its distal third."

After examining a large number of cases, I found that the general impression I had received was hardly in accordance with the above statements. In some 80 cases I have therefore taken special note as to the extent of the mesentery, and my results may be best shown in the following table:—

Sex.	No. of Cases.	Mesentery extending to tip of vermiform appendix	Mesentery extending [1] almost to tip of vermiform appendix.	Mesentery extending to, and less than half of the vermiform appendix.
Male	46	36	10	—
Female.....	34	28	4	2
Total...	80	64	14	2

It is thus seen that in far the majority of cases the meso-appendix extends along the whole length of the cæcal appendage. And in many of those cases where it seems to be much

[1] By "almost," I mean to indicate that, taking into account the length of the vermiform appendix, its meso-appendix nearly reached to its termination.

shortened, careful examination will often demonstrate a thin peritoneal fold extending up to its termination. Sometimes the mesentery appears to extend even beyond the termination of the appendix, and in some instances this terminal portion may present one or more large rounded collections of adipose tissue, projecting well beyond the end of the vermiform appendix.

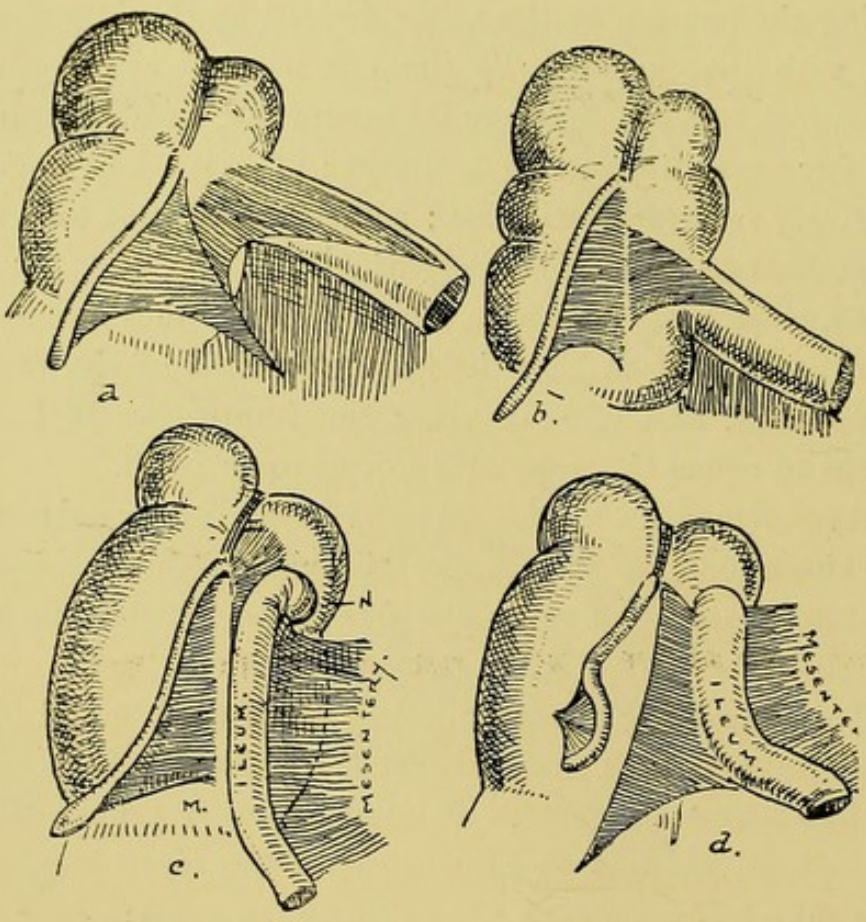

Fig. 10.—Variations in extent and attachment of the meso-appendix to a retro-cæcal vermiform appendix. (Treves.) A.—Cæcum turned upwards and showing the vermiform appendix in a retro-cæcal position, and having a well-marked meso-appendix. B.—Retro-cæcal appendix with its meso-appendix almost vertical, and having its attachment to the cæcum only. C.—Cæcum turned upwards and showing the vermiform appendix in a retro-cæcal position, and with diminished extent of mesentery. D.—Retro-cæcal appendix, almost wholly adherent to the cæcum, with greatly reduced meso-appendix. From a specimen taken from the body of a man, aged 33.

The general appearance of the meso-appendix is illustrated in Figs. 6, 7, 8 and 10.

In Fig. 10 certain of the variations in the extent and attachment of the mesentery of the appendix, are shown.

CHAPTER V.

THE VERMIFORM APPENDIX.—VARIATIONS IN POSITION

ACCORDING to Treves,[1] in an adult the vermiform appendix is usually found "behind the end of the ileum and its mesentery, and to point in the direction of the spleen." But, while this is undoubtedly the case in very many instances, I have found from an examination of a very large number of cases that it is by no means the customary position.

Indeed, the appendix, being in many instances a freely movable body, presents the greatest variety in its situation. This variation in position, while in great measure dependent on the length and character of its mesentery, is also, in certain cases, more or less dependent upon other factors, amongst which are the unusual arrangements of the ileo-cæcal region of developmental origin.

Previous inflammatory mischief is also, of course, one of the most important causes in the production of abnormal variations in the position of the appendix.

Alteration in Position of Congenital Origin.—The most frequent congenital abnormality involving the ileo-cæcal portion of the intestine is that to which Bennett and Rolleston[2] have drawn particular attention. Through the kind courtesy of these authors I am enabled to reproduce their illustration of the condition described by them.

In such cases the cæcum is small and of a "fœtal type." The vermiform appendix arises from the apex of the cæcum, and has usually a distinct mesentery. The cæcum lies high up over the right kidney, not having descended into the right iliac

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[1] TREVES. "The Surgical Treatment of Typhlitis," 1890, p. 12.

[2] BENNETT, W. H., and ROLLESTON, H. D. "Abnormal Arrangement of the Ileo-Cæcal Portion of the Intestine." *Journal of Anatomy and Physiology*, XXV., 1891, p. 87.

fossa. The peritoneum passes over it and binds it down, just as it normally fixes the ascending colon. No mesentery is found at the lower few inches of the ileum, the peritoneum passing directly over and fixing it to the back of the abdominal wall. The fixed ileum curves upwards over the right iliacus muscle and opens into the cæcum.

This condition, in a somewhat less degree than is shown in the accompanying illustration, is not of exceeding rarity. I

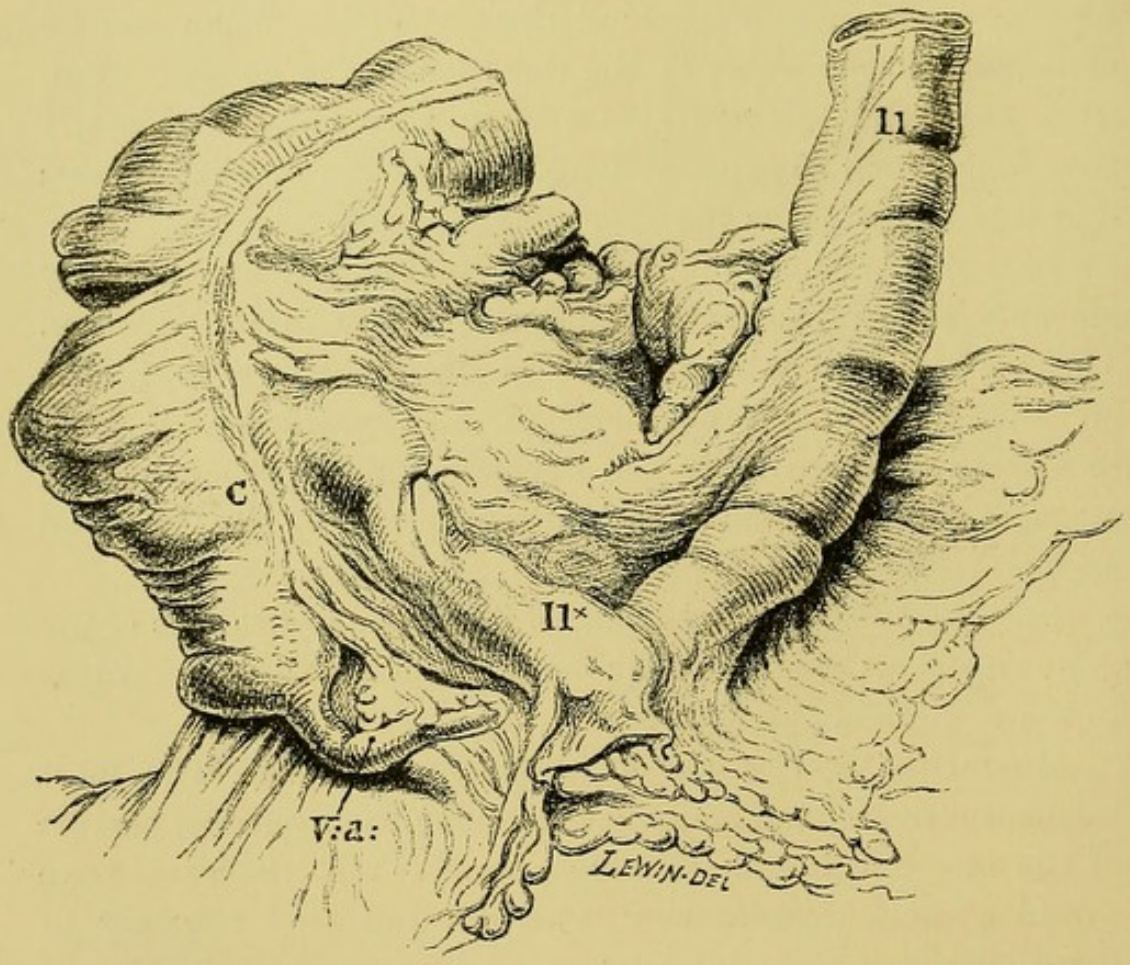

Fig. 11, showing an Abnormal Arrangement of the Ileo-Cæcal Portion of the Intestine (Bennett and Rolleston.)—Il. Ileum with a normal mesentery. Il.× Lower five inches of ileum devoid of mesentery. C. Cæcum. Va. Vermiform appendix.

have met with a number of examples in the Post-Mortem Theatre of the Manchester Royal Infirmary during the last two years, where the lower few inches of the ileum had no mesentery, but were firmly fixed down to the posterior wall of the abdomen.

Dr. Rolleston, among the details of the cases which he has been good enough to send me, mentions 21 instances in which

he found several inches of the lower end of the ileum bound down to the posterior abdominal wall and devoid of mesentery. In many instances the cæcum lay high above its usual position. In one case it was close to the liver; in another it was directly over the right kidney, and the lower five inches of the ileum ascended through the iliac fossa to reach the cæcum, being bound down to the posterior abdominal wall.

Alterations in Position Due to Intra-Uterine Inflammation.—In some instances important malpositions of the cæcum and appendix are apparently due to intra-uterine inflammation, in consequence of which adhesions may result which either hinder the proper development of these parts or prevent them occupying their normal positions.

Two such cases have recently been observed in the Dissecting room of The Owens College. I am indebted to the kindness of my friend Dr. Robinson for most generously supplying me with the following interesting details:—

Case 1.—Subject, that of an old woman. The cæcum and ascending colon lay in front of the right kidney. They were both distended, and, seen from the front, presented a somewhat quadrilateral outline. The anterior surface of the ascending colon was crossed obliquely, from above downwards and to the right, by the anterior band of longitudinal muscular fibres, and the inner band of longitudinal muscle crossed the anterior surface of the cæcum almost transversely. The upper border of the distended ascending colon was attached to the lower border of the transverse colon by a short, dense, fold of peritoneum, and its upper angle on the right side was continuous with the hepatic flexure.

The vermiform appendix sprang from the right side of the cæcum, and passed upwards and to the right, its apex being in contact with the right lobe of the liver. The lower five inches of the ileum lay in the right iliac fossa and the lower part of the right lumbar region, to the posterior wall of which it was attached by a very short mesentery. The small intestine terminated by opening into the posterior wall of the large gut at the ileo-cæcal junction.

Case 2.—Subject, that of an old man. Here a condition was found similar in all respects to that in the former case, except that the lower end of the ileum was entirely devoid of a mesentery.

The relations and appearances of the different parts in the first case are accurately shown in the accompanying woodcut (Fig. 12).

In Dr. Robinson's notes of these two exceptional cases, he points out that "in both these cases the gut occupies a position that is only normal to it at about the sixth month of fœtal life; it seems probable, nevertheless, that the malposition was not due simply to an arrest of development, for had that been the case the cæcum would have retained its fœtal character, the appendix being terminal

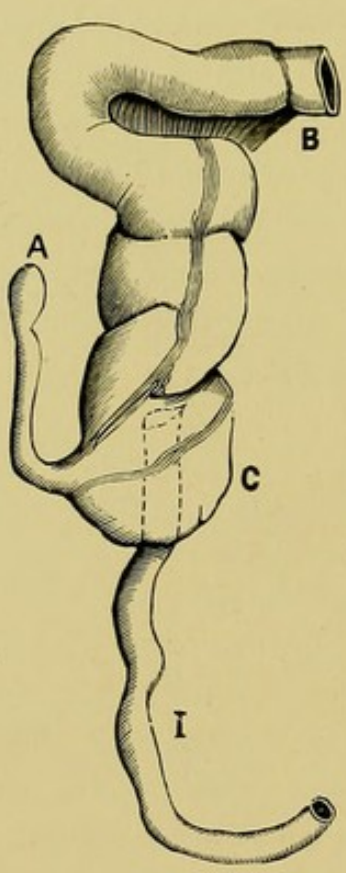

FIG. 12.—Showing abnormal position of the cæcum and vermiform appendix, due to arrest of development, probably from intra-uterine peritonitis, as met with in an old subject in the Dissecting room of The Owens College (Robinson). A.—Vermiform Appendix. C.—Cæcum. I.—Ileum. B.—Short and dense fold between transverse colon and ascending colon.

instead of lateral. Further, arrest of development alone will account neither for the peculiar position of the ileo-cæcal orifice and the vermiform appendix, nor for the transverse upper border of the ascending colon. It seems most probable that these features are attributable to an early attack of peritonitis, limited to the region of the rudimentary cæcum, and

resulting in the adhesion of the apex of the cæcum to the posterior abdominal wall, and afterwards in the contraction of that portion of the mesentery situated in the angle between the transverse and ascending colon. The transverse colon being stationary, the contraction of the mesentery drew part of the left lateral border of the ascending colon into a horizontal position and fixed it there. The fixation of the apex of the cæcum and the upper part of the ascending colon retarded the growth of both these portions of the gut, more especially on the right side, and consequently the increase took place principally towards the left and in front. The comparatively disproportionate development of the anterior part of the cæcum and ascending colon on the left side caused the transference of the ileo-cæcal orifice from the left side to the back of the large intestine. The attachment of the vermiform appendix to the right side of the cæcum, and the oblique position of the muscular bands on the front of the cæcum and ascending colon, which have been already referred to, give rise to an appearance as of twisting of the gut from left to right. This is, however, quite delusive, and is due to the relatively excessive growth of the left side of the cæcum and ascending colon."

Among the large number of cases which I have had opportunities of examining, I have found no similar case to the above; and, so far as I am aware, no such condition has been previously described.

Normal Variations in Position.—The position of the vermiform appendix, even when there is no evidence of congenital arrest of development or previous inflammatory affection, is so variable that it is almost impossible to describe any one position as *the normal* one. Hence it becomes necessary to enumerate certain positions which it occupies with sufficient frequency as to be considered, at least, normal variations.

1. To the right side, and behind the cæcum, and ascending colon.

This I have found to be a fairly common position, as I have recently pointed out before the Manchester Pathological Society. The appendix generally runs upwards parallel to the colon, and

usually has a fixed peritoneal attachment to the back of the cæcum and ascending colon, or to the right side of the meso-colon. This position is well shown in the accompanying illustration of a specimen which I met with in an adult male, dying from cardiac dilatation, consequent on mitral stenosis.

The appendix was unusually long—5¼ inches, and firmly fixed by peritoneum to the right side of the cæcum and ascending colon. There was no evidence of any inflammatory adhesions. The ascending colon

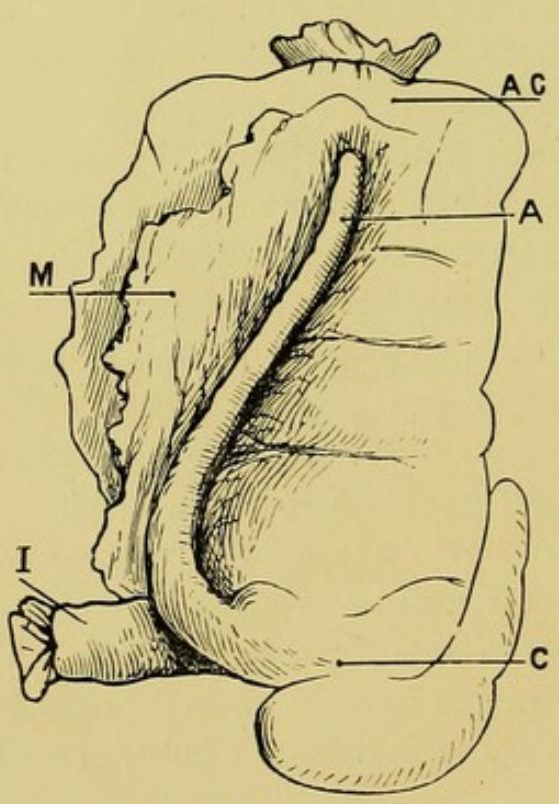

Fig. 13.—Retro-cæcal position of the vermiform appendix. A.—Vermiform appendix. C.—Cæcum. I.—Ileum. A C.—Ascending colon. M.—Meso-colon.

was short, and its meso-colon long, admitting of very free movement. The cæcum was so movable that it could be thrown over to the outer wall of the left iliac fossa. The appendix was of the thickness of a quill, and the same size throughout, and free from all evidence of inflammatory change. Its upper extremity reached upwards almost to the lower surface of the liver.[1]

In Fig. 14 the retro-cæcal position is further depicted, as

[1] *Manchester Royal Infirmary Post-mortem Reports*—Medical. Vol. 1891, p. 406. The preparation has been added to the Pathological Museum of The Owens College, No. 1456.

recently seen in the case of a young adult examined at the Royal Infirmary.[1] The appendix was 4½in. in length, and extended upwards almost to the liver.

Mr. Bland Sutton[2] has clearly pointed out the importance of this retro-cæcal position of the appendix, and through his kindness I am here able to reproduce his very admirable illustration. (Fig. 15.)

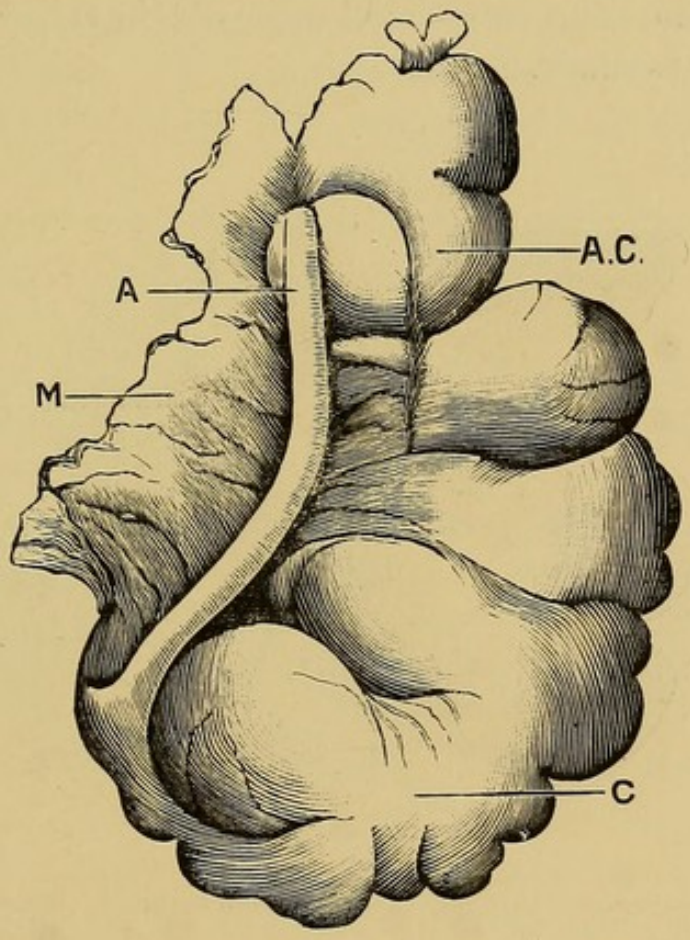

Fig. 14.—Retro-cæcal position of the vermiform appendix. A.—Vermiform appendix. C.—Cœcum. A C.—Ascending colon. M.—Mesentery of the ascending colon.

Sometimes the vermiform appendix, while having a retro-cæcal position, is more or less bent on itself. In one case I found the appendix ascending for 2in. behind the cæcum and

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[1] *Manchester Royal Infirmary Post-mortem Reports*—Surgical, Vol. 1892, p. 148, No. 153. The preparation has also been added to the Pathological Museum of The Owens College, No. 1,848.

[2] Bland Sutton. *Trans. Chir. Society Lond.*, XXIV., 1891, p. 119.

ascending colon, and then becoming acutely flexed outwards, and directed downwards for another $1\frac{3}{4}$in.[1]

In the Pathological Museum of The Owens College there is an interesting specimen[2] of the cæcum, ileum, and appendix, from a young subject, where the appendix, some three inches in length, is closely adherent to the posterior wall of the cæcum, and completely out of sight when the preparation is viewed from the front.

Treves found a retro-cæcal appendix in 18 per cent of the bodies he examined.

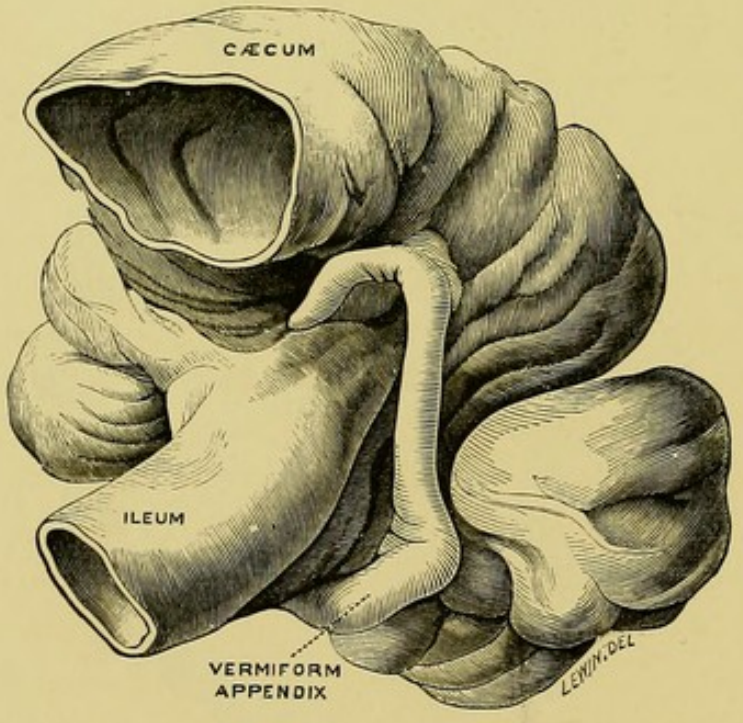

FIG. 15.—Retro-cæcal position of the vermiform appendix. (Bland Sutton.)

I have referred somewhat at length to this exceptional position of the vermiform appendix, not merely because it is one of anatomical interest, but because I am convinced it may be of the greatest pathological and clinical importance in certain cases of inflammation occurring in an appendix so situated. Should localised suppuration originate in connection with such an

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[1] This preparation has been added to the Pathological Museum of The Owens College, No. 1857.

[2] Pathological Museum of The Owens College, No. 1869.

appendix, it might readily be mistaken for a peri-nephritic abscess; and judging from a case where the appendix lay behind and to the inner side of the gall bladder, it seems very possible that suppurative appendicitis in such a case would closely simulate a suppurative condition of the gall bladder, or even an abscess of the liver.

2. In some few cases I have found the vermiform appendix lying within a peritoneal pouch on the right or outer side of the cæcum and ascending colon.

3. I have met with it passing directly across the sacrum, pointing towards the left, and being almost parallel with the lower part of the ileum.

4. In a considerable number of cases it hangs loosely over the edge of the pelvis into the cavity of the true pelvis.

5. In many instances it was free, but much coiled on itself, and then was often found just below the cæcum, sometimes distinctly beneath it; in other cases, it was tucked away upwards behind the ileum and its mesentery.

Ferguson, in an analysis of 200 cases, found that in 123 instances the appendix might be looked upon as a completely intra-peritoneal organ. In these it lay to the right of the cæcum in 19, descended downwards in 11, lay inward from the cæcum in 18, and behind the cæcum in the remaining 75. Ferguson also thinks that in 77 out of his 200 cases the appendix was so placed and covered by peritoneum that its perforation would open into the sub-peritoneal tissue and establish a diffuse form of cellulitis. As will have been already apparent, our observations differ somewhat from those of Ferguson. In practically all our cases the appendix was a truly intra-peritoneal structure.

Abnormal Variations in Position.—These are most frequently the result of previous inflammatory disease, and hence in these cases we usually find the appendix fixed in its abnormal position.

1. In a number of instances cases have been observed where the appendix was adherent to or formed a loop or constricting band around the ileum.

Kraussold[1] has met with it directed upwards and backwards, forming a distinct loop around the ileum.

Several cases have been published[2] where intestinal obstruction appears to have been due to the pressure exerted by such an encircling appendix. These will be referred to later.

Firket[3] has met with it adherent along its whole length to the ileum.

I have also found it adherent to the ileum as in the following instance :—

Case.[4]—A man, aged 34, where death resulted from acute tubercular phthisis. The appendix was only 2in. in length. It was found passing upwards and to the left behind the ileum, to which it was adherent by firm fibrous adhesions.

2. I have also met with the appendix firmly adherent to the cæcum and ascending colon.

3. Occasionally it is closely fixed to the omentum, to the mesentery of the ileum, or to the meso-colon or meso-cæcum when present, by tough inflammatory adhesions.

In the case of a man, aged 32, dying from sub-cranial hæmorrhage, the result of a fracture of the skull, I noted the following somewhat unusual position[5]:—

Case.—The cæcum was firmly fixed by adhesion to the posterior abdominal wall, and was drawn upwards and inwards, so that the origin of the vermiform appendix lay behind the ileum. The appendix descended from beneath the ileo-cæcal angle, crossed the cæcum almost transversely, but with a slight upward trend, being attached to the cæcum by slight adhesions. Its tip was firmly adherent to the omentum, which was itself adherent to the abdominal wall at the level of the antero-superior spine of the ilium.

4. The appendix may also become adherent to the rectum.

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[1] Kraussold. *Volkmann's Sam. klin. Vort.*, 1881, CXCI., 1707.

[2] Pughe. *British Medical Journal*, August 29, 1885, p. 392.

[3] Firket. *Ann. d. Soc. Méd.-Chir. d. Liége*, 1882, XXI., 58.

[4] *Manchester Royal Infirmary Post-mortem Reports*—Medical. Vol. 1891, No. 123.

[5] *Manchester Royal Infirmary Post-mortem Reports*—Surgical. Vol. 1892, p. 34, No. 14. The preparation has been added to The Owens College Pathological Museum. No. 1457.

5. Sometimes it is found firmly fixed to the bladder, or in the female to the internal genital organs.

6. Frequently it is adherent to the peritoneum lining the iliac fossa or posterior abdominal wall.

7. It may also become adherent to the peritoneal lining of the anterior abdominal wall.

The importance of such adhesions will be at once seen when the condition of appendicular fistulæ is discussed.

The presence of the appendix in the peri-cæcal peritoneal pouches will be considered in the following chapter, under the heading of Internal Herniæ.

CHAPTER VI.

HERNIÆ OF THE VERMIFORM APPENDIX.

AMONG the most important forms of malposition of the vermiform appendix are the so called appendicular herniæ. Indeed so important, both clinically and pathologically, are these cases, that a separate chapter may well be devoted to their consideration.

The herniæ of the vermiform appendix readily divide themselves into two large groups,—(1) the external and (2) the internal.

External Herniæ.—An external hernia of the appendix is naturally most frequently met with on the right side and within an inguinal hernial sac. Geissler, however, has recorded a very exceptional case where, in an aged patient of seventy, it was met with on the left side.

The importance of length, size, presence, and extent of meso-appendix and free movability, as factors permitting the occurrence of a hernia, are so apparent as hardly to need mention.

In children the appendix frequently comes down into a right inguinal hernia, and Mr. Wright informs me that he has often seen the appendix lying within the hernial sac. In the case of a male infant of two months,[1] which died after the operation of herniotomy performed to relieve a strangulated congenital right inguinal hernia, I found the appendix unusually long and the cæcum very movable. The appendix and cæcum had been found in the sac at the operation and returned.

In the greater number of cases the vermiform appendix

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[1] *Manchester Royal Infirmary Post-mortem Reports*—Surgical. Vol. 1887, p. 659. No. 307.

forms but a small part of the contents of the hernial sac; and since it does not commonly give rise to troublesome conditions, it has been somewhat neglected both by surgeons and pathologists. Still, in certain instances, it may not only produce symptoms of considerable perplexity, but may become the seat of pathological processes of the gravest character.

Sometimes the herniated appendix becomes adherent to the wall of the sac. Lockwood[1] in his Lectures on Hernia has an illustration of this condition. Dr. Habershon[2] also records a case occurring in a boy of 16 where the appendix was adherent in the inguinal canal. In this case the testis had not descended. Shaw[3] had also met with an appendix in a hernial canal, as far back as the year 1848. Mr. John Wood[4] records a most interesting case where the appendix had become adherent to the neck of the sac of an inguinal hernia by its base, so as nearly to obliterate the opening into the abdomen, the extremity of the appendix lying in the fundus of the sac.

The possiblity of such adhesion as a cause of strangulation, although undoubtedly rare, is certainly to be borne in mind. Several such cases have been published.

Thus, Dieffenbach[5] mentions a case where, within a large inguinal hernia, the cæcum was found strangulated by an adherent appendix.

Davies-Colley[6] also records several most interesting instances where incarceration or strangulation of the appendix within a hernial sac has been met with.

Occasionally the herniated appendix becomes inflamed, and such cases often present somewhat puzzling features. A number of examples have been recorded.

Thus, Thompson[7] records a case where he found the appendix

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[1] Lockwood. "Hunterian Lectures on Hernia," 1889, p. 78.
[2] Habershon. "Diseases of Abdomen," p. 445.
[3] Shaw. *Prov. Med. and Surg. Jour.*, 1848, p. 477.
[4] Wood. *Trans. Path. Soc. London*, X., p. 170.
[5] Dieffenbach. "Operative Surgery," II., p. 571.
[6] Davies-Colley. *Guy's Hospital Reports*, XLII., 1883-84, p. 429.
[7] Thompson. *British Medical Journal*, Sept. 23, 1882, p. 579.

involved by an inflammatory process within the sac of a right inguinal hernia. The patient was a pork-butcher, aged 57. The distal end of the appendix contained a small, sharp, rough piece of bone, which had probably set up the inflammatory condition.

Annandale[1] records a remarkable instance met with in a lady of 60, where the vermiform appendix, much thickened and greatly congested, was found as the only intestinal contents within the sac of a right femoral hernia. The base of the appendix was firmly adherent to the inner aspect of the neck of the sac and thoroughly plugged it. About an inch from its tip was a small perforation.

Swasey[2] records a case met with in a woman of 67, where there was a femoral hernia of the appendix, unaccompanied by any other portions of the bowels.

Hall,[3] during the course of an operation for supposed strangulated hernia, found within the sac, a perforated appendix apparently due to tubercular disease.

Cruveilhier[4] also mentions a case occurring in a woman between 50 and 60, where perforation of the appendix, when situated within a hernial sac, occurred.

Thurmann[5] mentions a case where the appendix becoming inflamed within a hernial sac gave rise to a scrotal tumour as large as two fists.

Waring and Eccles[6] have recently recorded a case where in a woman of 46, the vermiform appendix formed the sole contents of the sac of a right femoral hernia. The appendix was ulcerated and had perforated at the seat of its constriction. It was ligatured by Mr. Langton above the perforation, and the part below removed. The patient recovered without any complication.

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[1] Annandale. *Lancet*, March 30, 1889, p. 627.

[2] Swasey. *Medical Record*, XIX., 1881, p. 706.

[3] Hall. *New York Med. Jour.*, XLII., p. 662.

[4] Cruveilhier. "Anatomie Pathologique," Paris. 1835, p. 42.

[5] Thurmann. *Prov. Med. and Surg. Jour.*, 1848, p. 270.

[6] Waring and Eccles. *St. Bart. Hosp. Reports*, XXVII., 1891, p. 179.

Cases of hernia of the appendix have also been recorded by Pick,[1] Court,[2] De Morgan,[3] and Wölfler.[4]

Internal Herniæ.—The internal hernias of the appendix constitute a deeply interesting and most important group. They are probably far more common than is usually imagined. Most frequently the appendix becomes herniated into one of the cæcal fossæ, already described and illustrated in Chapter IV. Comparatively little notice has been taken of such occurrences, although should the appendix become the seat of an inflammatory process, and the case submitted to surgical interference, it might give rise to grave difficulties.

Recently Lockwood[5] has drawn attention to the possibility of the appendix becoming herniated in one of the peritoneal pouches which surround the cæcum.

Jonnesco[6] also clearly points out that when the appendix is not readily found, it is often because it is herniated, and lies hidden within one of these peritoneal pouches in the ileo-cæcal region.

In several cases I have found the appendix so tucked away in these peritoneal fossæ that only after some little searching could it be clearly demonstrated. Thus, in the case of a man of 46,[7] where death occurred from general peritonitis following operative interference for the relief of a long-standing stricture of the urethra, I found the appendix lay out of sight, in a distinct pouch situated to the inner side of the cæcum and behind the termination of the ileum. The appendix was firmly fixed to the walls of the fossa, and could not be withdrawn.

Elliot[8] has recorded the history of a somewhat similar case, where, at the operation for removal of the diseased appendix,

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[1] Pick. *Lancet.* 1880, I., p. 801.

[2] Court. *Lancet.* 1870, II., p. 401.

[3] De Morgan. *Trans. Path. Soc. Lond.*, XXV., p. 107.

[4] Wölfler. *Langenbeck's Archiv. fur klin. Chir.*, XXI., p. 432.

[5] Lockwood. "Hunterian Lectures on Hernia."

[6] Jonnesco. "Hernies Internes Rétro-Peritonéales." Paris, 1890, p. 104 et seq.

[7] *Manchester Royal Infirmary Post-mortem Reports*—Surgical. Vol. 1892, p. 142, No. 50. The specimen has been added to The Owens College Pathological Museum, No. 1844.

[8] Elliot. *International Med. Jour.*, 1891, p. 556.

giving rise to recurrent attacks of appendicitis, it was only after careful search that it was found, firmly adherent within an ileo-cæcal fossa.

Reference may, perhaps, be best made here to that interesting class of cases where the vermiform appendix has been instrumental in bringing about strangulation in some other portion of the bowel. This has, of course, been usually due to adhesions of the appendix to surrounding parts, and of such a character as to form a loop, through which some portion of the intestine, generally the lower end of the ileum, might be strangulated.

Marshall,[1] in 1846, recorded a case of strangulation of a portion of the ileum in a woman of 24, from a band passing from the appendix cæci, about its middle, to a separate part of the ileum superiorly.

Little,[2] in 1847, published a case where intestinal obstruction resulted from an encircling of the ileum by an adherent appendix.

Risdon Bennett[3] mentions a case where, in a woman of 46, the extremity of the appendix was adherent to a cystic tumour of the right ovary. The appendix formed a loop around the ileum and commencement of the ascending colon, cutting it off, to a certain extent, from the remainder of the intestines.

Lincoln,[4] in 1853, met with a case of strangulation of the ileum consequent on adhesion of the appendix to the mesentery.

Andrews[5] has also recorded an interesting case where intestinal obstruction was caused by "an adhesion formed between the end of the vermiform appendix, which was twisted back and to the left, and a loop of the ileum." This adhesion, $\frac{1}{3}$in. thick and $\frac{1}{2}$in. long, bridged the ileum 4in. above the valve, so as to compress it against the spinal column, and completely occlude it.

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[1] Marshall. *Lancet*, 1847, I., p. 42.

[2] Little. *Lancet*, 1847, II., p. 389.

[3] Bennett. *Trans. Path. Soc. Lond.*, IV., 1852, p. 246.

[4] Lincoln. *Amer. Jour. Med. Sci.*, 1853, p. 364.

[5] Andrews. "Constriction of Ileum by Appendix Vermiformis." *Amer. Jour. Med. Sci.*, 1867, I., 149.

Hendricks[1] reports a case of intestinal obstruction where the appendix was drawn across the bowel at the junction of the ileum and cæcum, and attached to the posterior wall of the abdomen, a little to the right of the spine, forming a loop about six inches in circumference. Through this loop about 18 in. of small intestine was crowded.

Penrose[2] also mentions the case of a woman of 22, where bands of adhesions, the result of an old appendicitis, led to

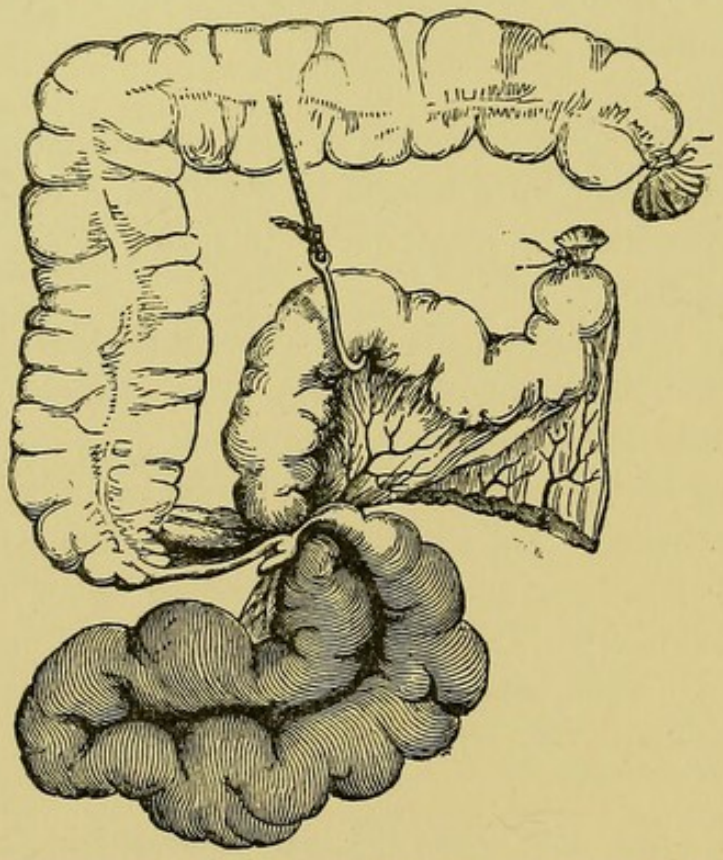

Fig. 16. Strangulation of the Ileum through an aperture in the Peritoneal Fold of the Vermiform Appendix (after Little).

obstruction of the ileum, with gangrene and perforation of the bowel above the seat of constriction.

An interesting case[3] is recorded in our post-mortem records which deserves mention here.

Case.—The subject was a young boy, aged ten. He died with the characteristic symptoms of intestinal obstruction. A small peritoneal

[1] Hendricks. *Med. Record*, Nov. 18, 1876, p. 764.
[2] Penrose. *Medical News*, Nov. 23, 1889, p. 578.
[3] *Manchester Royal Infirmary Post-mortem Reports.*—Surgical, Vol. 1887, p. 577, No. 276.

band, 4in. long, passed from the mesentery of the appendix to the mesentery of the ileum, completely constricting the ileum where it crossed it at a point 2in. above the ileo-cæcal junction.

Partridge,[1] in 1861, showed a preparation at the London Pathological Society where a knuckle of the ileum, immediately above its termination, was found strangulated and much congested, in consequence of having passed through and become impacted in a hole or interspace in the mesentery of the appendix vermiformis.

The late Dr. Little,[2] in 1871, brought a specimen before the Dublin Pathological Society in which strangulation of the ileum occurred through an aperture in a peritoneal fold of the appendix, which he speaks of as the "ileo-cæcal omentum." The accompanying illustration (Fig. 16) depicts the appearance of the preparation.

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[1] Partridge. *Trans. Path. Soc. Lond.*, 1860-61, XII., p 110.

[2] Little. *Dublin Quar. Jour.*, LII., 1871, p. 237.

CHAPTER VII.

THE HISTOLOGY OF THE VERMIFORM APPENDIX.

IT is a somewhat remarkable fact that practically no information as to the histological structure of the vermiform appendix can be obtained from what are usually considered our standard manuals.

The appendix appears generally to have been considered to resemble in great measure the structural arrangement of the cæcum and large intestine, and such to some extent is indeed the case.

Neill,[1] in 1851, pointed out that the appendix vermiformis differs very materially from that of the colon in the arrangement of its capillaries, and illustrated the appearance seen in injected preparations, in drawings accompanying his paper.

The most striking histological feature of the appendix is its richness in lymphoid elements. Watney,[2] in his valuable monograph "On the minute anatomy of the alimentary canal," appears to have been one of the first to distinctly call attention to the similarity in structure between the vermiform appendix of the rabbit and the structure of the tonsils. This striking similarity seems to have impressed several microscopists. Thus Ransohoff[3] has pointed out that the appendicular mucous membrane is much "like a lymphatic gland spread out;" and he also shows that, like the tonsils, it is subject to recurrent inflammations which naturally subside after the twentieth or thirtieth year. Bland Sutton[4] has also insisted on the very marked histological similarity between the vermiform appendix

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[1] NEILL. "On the structure of the mucous membrane of the appendix vermiformis, cæci, and colon."—*Medical Examiner*, 1851, p. 85.

[2] WATNEY. *Philosophical Transactions of the Royal Society*, Part II. for 1876 p. 459.

[3] RANSOHOFF. *Trans. Am. Surg. Assoc.*, Vol. VIII., 1890, p. 151.

[4] SUTTON (BLAND). *Lancet*, 1891, I., p. 547.

and the tonsil, and shown that their inflammatory lesions, both simple and suppurative, present points of great resemblance. He also points out that in both inflammatory affections are particularly liable to occur early in life.

It is also interesting to observe that the calculi frequently met with in the tonsils are, as far as their inorganic constituents are concerned, practically identical with concretions of the vermiform appendix.

During the course of my investigation, I have microscopically examined a considerable number of preparations of appendices from both sexes, and at widely differing ages.

In the greater number of instances I found the most satisfactory results could be obtained only by embedding the preparations. Thus, generally, after hardening in alcohol, I have stained *en masse*, with borax-carmine, and embedded in wax, using the Cambridge Rocking Microtome for the cutting of the sections. Although very satisfactory preparations may be obtained by the ordinary methods of freezing, some process of embedding is much to be preferred, and is almost essential for the preparation of very thin sections of those appendices rich in lymphoid elements. Celloidin may be used with great advantage.

From the examination of my preparations,[1] I have come to the conclusion that the differences in histological structure are almost as numerous and varied as the more readily recognised differences in anatomical form.

The most prominent feature, however, in nearly all cases, is the abundance of lymphoid elements.

The *mucosa* is composed of a fine reticulum with cells held in its meshes. The reticulum of the lymphoid follicles is continuous with that of the rest of the mucosa. The lymphoid follicles themselves consist almost entirely of lymph corpuscles. Generally the lymphoid elements are not confined to any distinct or circumscribed areas, but more or less infiltrate the whole of the mucosa. Frequently considerable masses of lym-

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[1] My collection of microscopical preparations of the vermiform appendix has been added to the Pathological Collection of The Owens College.

phoid tissue project beyond the usual level of the mucous coat into the lumen of the appendicular canal, thus strongly resembling similar arrangements met with in the tonsils.

The *glands of Lieberkühn* vary considerably. Sometimes they are numerous and of considerable size, but in many instances I have found them small or almost absent.

Through the kindness of Mr. Bland Sutton, I am enabled to reproduce his illustration representing the microscopical struc-

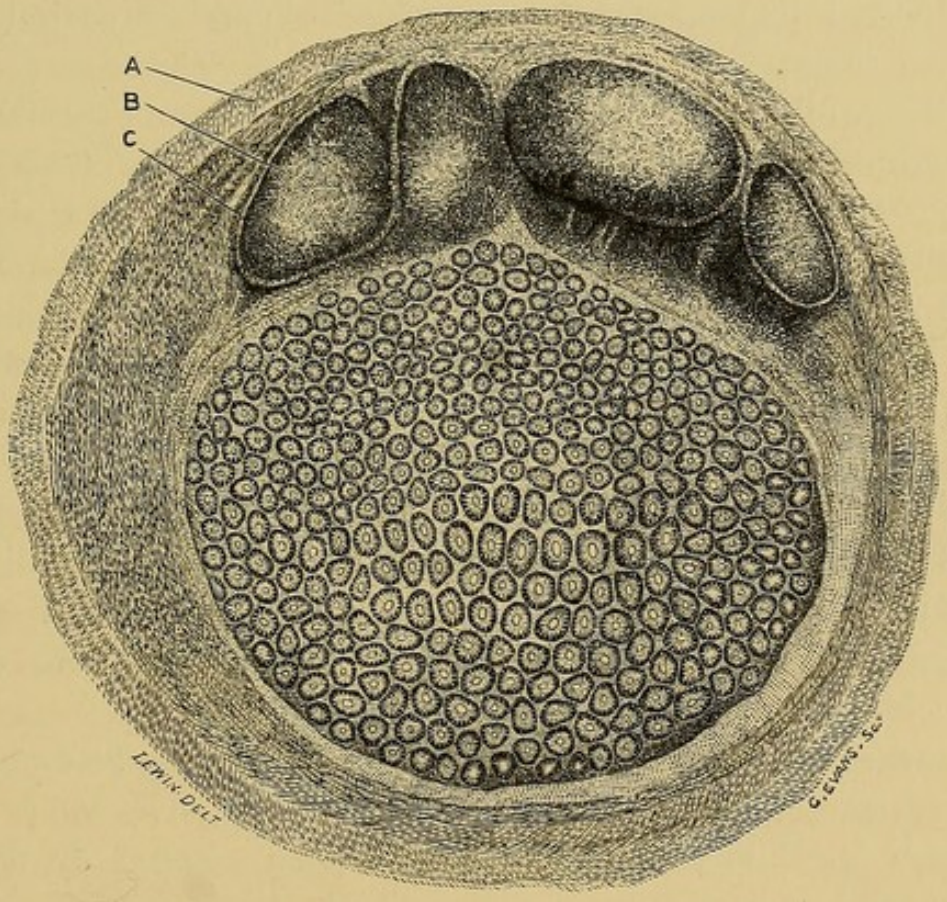

FIG. 17.—Illustrating the microscopical appearance of the tip of the vermiform appendix (Bland Sutton). A.—External coat of the vermiform appendix. B.—Masses of lymphoid tissue. C.—Delicate capsule around collection of lymphoid tissue. The glands of Lieberkühn are shown in section in the central portion, and situated at the tip of the organ.

ture of the tip of the vermiform appendix. In the specimen from which the drawing is taken the glands of Lieberkühn seem to have been exceptionally numerous. In most of my cases the lymphoid tissue of the mucosa has appeared to separate the glands to a greater extent than is indicated in the drawing.

The deeper layers of the mucosa appeared, in many cases, dense and built up of closely applied lymphoid cells, evidently undergoing proliferation, and staining more deeply than the more superficial parts.

In some instances a fairly distinct *muscularis mucosæ* existed, but in others little or no indication of such could be observed.

In some cases there may be practically no mucosa. This is, of course, always the case in those instances of obliterated lumen, where the appendix consists entirely of fibrous tissue.

But while there may be abundance of lymphoid tissue, sometimes the glands are almost entirely absent. This was very marked in the case of a young adult[1] who died from the results of a gun-shot wound.

In some cases the lymphoid tissue appeared most abundant at the tip, but this is by no means generally the case, for frequently the terminal portion of the vermiform appendix is thick and extremely fibrous.

In children the lymphoid element is usually most abundant.

In a boy of five[2] I have found the appendix exceedingly rich in lymphoid tissue, and in a newly-born child[3] I have seen the Lieberkühn crypts exceptionally numerous and well-marked.

But abundance of lymphoid tissue may usually be found in the appendices of adults, and even in those well advanced in life. I have found it very abundant in an old man[4] of 62, dying from cerebral hæmorrhage.

In several cases of phthisis[5] there has been a very considerable amount of lymphoid tissue, although not presenting any distinct evidence of tubercular infiltration.

The *sub-mucosa* consists of areolar tissue, containing numerous fine blood vessels.

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[1] Owens College Pathological Collection, No. 1830.
[2] Owens College Pathological Collection, No. 1512.
[3] Owens College Pathological Collection, No. 1800.
[4] Owens College Pathological Collection, No. 1829.
[5] Owens College Pathological Collection, Nos. 1485, 1492, 1475, 1459.

The outer coats—These are usually spoken of as the muscular coats. The *inner* layer of the two coats, which usually forms the greater part of the appendicular walls, consists of fine fibrous tissue arranged in a more or less circular manner, together with a somewhat varying amount of muscular fibres.

The *outer* layer is also mainly made up of fibrous tissue. Sometimes distinct bundles of longitudinal muscular fibres can be detected.

Both the inner and the outer layers vary considerably in their extent, and also in their degree of separateness. Sometimes they are exceedingly thick, and the lumen of the appendix is diminished to a mere chink, while in other instances the walls are very thin and the lumen may or may not be increased. Sometimes the tip is exceedingly thin.

Austin Flint[10] states that the muscular coat of the appendix consists of longitudinal fibres only.

The *peritoneal coat* forms the outer or encircling tunic of the appendix. Along what usually forms the internal border of the appendix the peritoneal folds come into close approximation, so forming the meso-appendix.

There can be no doubt that variations in the histological structure of the appendix will materially affect the progress and result of certain inflammatory processes; and when we remember that Clado has shown by his interesting experiments on certain of the physical properties of the vermiform appendix that it is contractile and yet unextensible, the pathology of many cases of gangrenous appendicitis is much more readily understood.

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[1] FLINT. Text-Book of Human Physiology, Ed. IV., 1888, p. 258.

CHAPTER VIII.

CYSTIC DILATATION OF THE VERMIFORM APPENDIX.

IN some instances the canal of the appendix becomes constricted or obliterated, either at its orifice or further down. The tube may then become distended into a cyst. Virchow appears to have been the earliest observer to recognise this condition, which he described as "colloid degeneration" of the vermiform appendix. According to him, the dilatation may attain the size of a large fist. Leube[1] says the contents of such a sac consist at first of tenacious mucus, but that later it contains merely a watery serum, because when the wall of the appendix becomes much distended it also becomes thinned and its vessels more superficial. Thus, he states, the watery portion of the blood is favoured and the formation of mucus is reduced to a minimum (*hydrops processus vermiformis*).

In a case mentioned by Weir[2] the fluid contents of a cystic appendix were said to be exactly like vitreous humour.

Bristowe[3] also briefly refers to the condition of cystic dilatation of the appendix.

Treves[4] states that it is common to find the free end of the appendix greatly enlarged and distended from the retention of mucus and other matters in the distal end of the canal. Such, however, has not been my experience.

I have only met with one well-marked example of cystic appendix in an examination of several hundred cases during the past two years. No such cases are recorded in our Post-mortem Reports.

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[1] LEUBE. "Ziemssen's Cyclopœdia of the Practice of Medicine," VII., p. 361.

[2] WEIR. *Medical Record*, Jan. 10, 1880, p. 44.

[3] BRISTOWE. In "Reynolds's System of Medicine," III., p. 121.

[4] TREVES. *Lancet*, Feb. 9, 1889, p. 268.

The following is a brief description of this single example:—

Case.—Cystic Dilatation of the Vermiform Appendix.—In the case of a middle-aged female. Mary D.,[1] who died from extensive vegetative endocarditis, the appendix was found to be completely shut off from the cæcum, and no sign or indication of any previous communication could be observed. The appendix was greatly distended and presented two very distinct diverticular processes, which were directed between the folds of the mesentery of the appendix. The diverticula were connected with the dilated cavity of the appendix through well-defined circular openings. There was no muscular tissue in the walls of the diverticula. The appendix contained a thick gelatinous light-yellow substance, and also a small portion like in appearance to curdled milk.

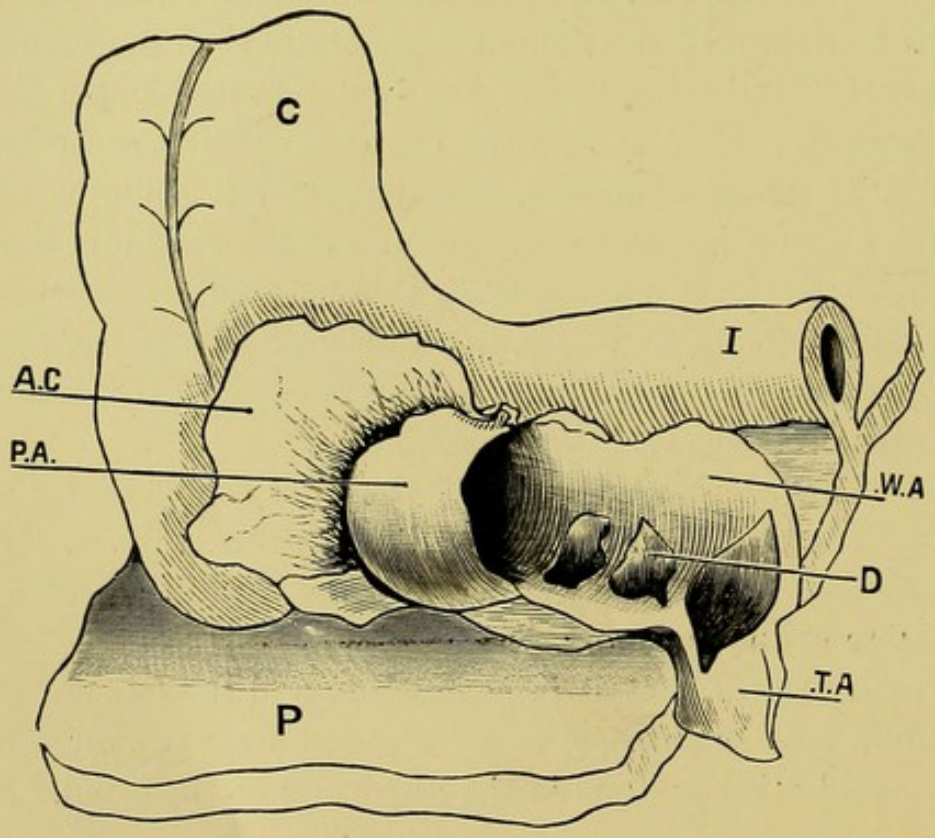

FIG. 18.—Cystic dilatation of the vermiform appendix from the patient, Mary D. The cystic organ has been laid open in its greater part. A portion of the anterior wall of the cæcum has also been removed in order to show the proximal occluded end of the appendix bulging into it. P.A.—Proximal end of the vermiform appendix. T.A.—Terminal portion of the appendix. W.A.—Walls of the cystic appendix. D.—Secondary diverticula. A.C.—Cæcum, a portion of its anterior wall having been removed. C.—Ascending colon. I.—Ileum. P.—Peritoneum.

The accompanying illustration shows the appearance of the cystic appendix in this case (Fig. 18).

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[1] *Manchester Royal Infirmary Post-mortem Reports*—Medical. Vol. 1891, p. 32, No. 11. The preparation has been added to the Pathological Museum of The Owens College, No. 1278.

Fenwick[1] mentions a case occurring at the London Hospital, where a somewhat similar condition appears to have existed. "The appendix was distended by a milky fluid, the communication with the cæcum being obliterated."

Coats[2] also mentions a case in which the vermiform appendage had been converted into a large cyst, measuring five inches in its long diameter. The cyst contained a tenacious coloured material, and the wall was thick and firm.

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[1] Fenwick. "Clinical Lectures," p. 10.

[2] Coats. *Glasgow Medical Journal*, VII., 1875, p. 126.

CHAPTER IX.

ABNORMAL CONTENTS OF THE VERMIFORM APPENDIX.

THE presence of fæcal concretions and foreign bodies has long been looked upon as of the greatest importance in the production of disease of the vermiform appendix, and there can be no doubt that they are ætiological factors of considerable influence in setting up certain inflammatory changes in the appendix. Fenwick,[1] in an analysis of 120 cases of perforating appendicitis, found that in 55 it was stated that either a concretion, a mass of fæces, or some other foreign body was present, and he points out that it is fair to conclude that the number might have very possibly been larger if a sufficiently careful search had been practised in them all.

Mr. Symonds,[2] from an examination of the "Guy's Hospital Post-mortem Records," found that "in 23 fatal cases of appendicitis there was a concretion, and only one of a foreign body in the appendix, which was a grain of wheat."

Matterstock[3] found concretions in 53 per cent of his 169 collected cases of appendicitis. In 12 per cent only was a foreign body found.

Krafft,[4] in 40 cases, met with fæcal concretions in 36, and foreign bodies in only 4, while Maurin,[4] in 60 cases, found fæcal concretions in 34, and foreign bodies in no less than 26.

Fitz,[5] in 152 cases of perforative appendicitis, found fæcal masses in 47 per cent, and foreign bodies only in 12 per cent.

Ferguson,[6] in 200 cases, found foreign bodies in 15. There

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[1] Fenwick. "Clinical Lectures on Obscure Diseases of the Abdomen," 1889, p. 9.

[2] Symonds. *British Medical Journal*, Dec. 19, 1885, p. 1161.

[3] Matterstock.—*Gerhardt's Handbuch der Kinderkrankh.*, 1880, IV., 2., 897. Quoted by Fitz, *Trans. Assoc. Amer. Phys.*, 1886, I., p. 112.

[4] Quoted by Talamon. "Appendicite et Pérityphlite," p. 43.

[5] Fitz. *Trans. Assoc. Amer. Phys.*, I., p. 113.

[6] Ferguson. *Amer. Jour. Med. Sci.*, 1891, p. 61.

were enteroliths in two, a small stone in one, a small bone in another, a piece of a screw nail in a further case, and such articles as orange pips, cherry stones, etc., in the other ten.

Osler[1] also states that foreign bodies rarely lodge within the appendix. In one case he met with eight snipe shots, and in another there were five apple pips. Oval bodies, resembling date stones, and consisting of inspissated mucus and fæces, in which in time lime salts are deposited, he states, are very common.

There can be no doubt but that far and away the most frequent abnormal contents of the appendix are hardened fæcal masses, which are frequently infiltrated with lime salts forming distinct concretions.

Fæcal accumulations under certain circumstances set up a catarrhal appendicitis, and the secreted mucus, rich in carbonate and phosphate of lime, yields these salts to form encrusted deposits in and around these fæcal masses. Such a calculus, or concretion, enlarges by the deposition of additional layers, and becoming incarcerated, may finally produce, through its pressure on the walls of the appendix, necrosis or gangrene.

Mr. G. A. Wright[2] recently showed at a meeting of the Manchester Pathological Society, a large whitish concretion, $\frac{3}{4}$in. long by $\frac{1}{2}$in. broad, lying in the interior of the vermiform appendix in a cavity, the walls of which were shreddy and almost gangrenous in appearance. The appendix presented no perforation.

On the same occasion Mr. Wright also showed a large concretion, $\frac{1}{2}$in. long and about $\frac{1}{4}$in. in transverse diameter, which had been found in the vermiform appendix of a child of nine where death resulted from acute general suppurative peritonitis.

Chemical analysis of these concretions by Volz[3] and Bierhoff show them to be made up of phosphate of lime and magnesia, carbonate of lime and cholesterin, with traces of chlorine and sulphur. Dr. Odling and the late Dr. Golding Bird have also

[1] Osler. "Principles and Practice of Medicine," 1892, p. 406.

[2] Wright. "Chronic Appendicitis with Concretion" and "Concretion from Vermiform Appendix." *Trans. Path. Soc. Manchester*, 1892, p. 36.

[3] Volz. *Arch. gén. de Méd.*, 1844.

shown that they consist mainly of carbonate and phosphate of lime. A concretion examined by Dr. Prout consisted of phosphate and carbonate of lime, with a small quantity of animal and oleaginous material.

But the presence of inspissated fæces, or foreign bodies, is by no means the only factor in the establishment of appendicular disease. In a very large number of cases where the appendix is quite healthy and with mucosa perfectly intact, I have found fæcal accumulations. Indeed I believe, in many instances, there is, as it were, an appendicular passage of fæces. Constantly I have noted that the fæcal matter in the appendix, both as regards colour and consistency, and apparently other characters, was identical with that in the cæcum and ascending colon, conclusively showing that, although fæces may readily pass into the appendix, they no less readily pass out, provided, of course, that appendicular peristalsis is not interfered with.

It is said that the appendix has a relatively large absorbent surface, and in some instances such, no doubt, is the case. It is possible, therefore, that rapid absorption of fluid, if such occurs, may be of considerable importance in the formation of concrements, which, in some cases, set up inflammation, leading to ulceration, and often gangrene and perforation.

It is necessary, however, to bear in mind the possibility of fæcal matter, or some foreign body, setting up a catarrhal inflammation which might go on even to perforation, and yet the exciting cause being first passed on into the cæcum by peristalsis.

All sorts of small foreign bodies have been met with in the appendix, such as various forms of seed, especially of fruit; hairs, particularly bristles; shots, pins, pills, pea-nuts, a human tooth, shells of nuts, and pieces of bone.

As regards the fruit-stones and seeds stated to have been found, the evidence in many instances does not always appear sufficient to exclude the possibility of an error in observation. In one case I found a body having the exact appearance of the much-talked-of cherry-stone. On cutting through it, it was seen to consist of nothing but concentric layers of hardened fæces.

A similar body was probably that noted by Mr. Parette,[1] who describes what he terms a "cherry-stone," but adds, "it was quite friable, easily broken up with slight pressure."

As regards the traditional cherry-stone there would seem to be no ground for believing that appendicitis is more common in cherry-eating countries, such, for instance, as Switzerland.

A strong belief in the danger of swallowing cherry-stones nevertheless exists in the popular mind, and I am told this is particularly the case in France.

No doubt cherry-stones, however, do occasionally lodge in the appendix. Mr. Haynes Lovell[2] records a case where an undoubted cherry-stone was found in the pelvic cavity, having escaped from the appendix through a recent perforation.

Service[3] records an instance where an orange pip, trapped within the appendix, led to perforative appendicitis in a girl of eleven. Microscopic examination showed the pip to have a distinct fibro-cellular structure.

Coats[4] also mentions a case where the appendix was found to contain a body having a close resemblance to the stone of an orange. Microscopic examination showed it to be composed simply of inspissated fæces and the mycelium of a fungus.

Mr. Morrant Baker[5] records a remarkable case where a pin had its point protruding through the appendix, its head being buried in a mass of fæces.

Somewhat similar cases of impaction of a pin within the appendix have been met with by Ashby,[6] Boussi,[7] Legg,[8] and Mestivier.[9]

Ward[10] also details a most interesting case where the appendix was perforated by a bristle, apparently belonging to an old

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[1] Parette. *British Medical Journal*, Aug. 26, 1882, p. 368.
[2] Lovell (Haynes). *British Medical Journal*, April 24, 1886, p. 778.
[3] Service. *Lancet*, February 21, 1880, p. 286.
[4] Coats. *Glasgow Medical Journal*, XI., 1879, p. 319.
[5] Baker (Morrant). *British Medical Journal*, June 15, 1889, p. 1347.
[6] Ashby. *Lancet*, 1879, II., p. 649.
[7] Boussi. *Bull. Soc. Clin. de Paris*, 1878, II., p. 15.
[8] Legg. *St. Barth. Hosp. Rep.*, 1875, XI., p. 85.
[9] Mestivier. *Jour. de Méd. Chir. Pharm, etc.*, 1759, X., p. 441.
[10] Ward. *Trans. Path. Soc. Lond.*, 1855, VI., p. 197.

tooth-brush. It had ulcerated through the appendix at the junction of its distal one-fourth with the proximate three-fourths. Death had resulted from general suppurative peritonitis.

Lumbrici have been found within the appendix, as in a case mentioned by Fenwick.[1] Blackadder,[2] as far back as 1824, recorded a most remarkable instance of impaction of a very large lumbricus in the vermiform appendix, where death occurred three and a half hours after the onset of the acute abdominal symptoms.

Birch-Hirschfeld[3] appears to have met with hydatids involving the appendix.

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[1] Fenwick. "Clinical Lectures on Obscure Diseases of the Abdomen," p. 9.

[2] Blackadder (H. Home). "Notices of certain accidents and diseased structure of the caput cæcum cœli and its appendage."—*Edin. Med. and Surg. Jour.*, XXII., 1824, p. 18.

[3] Birch-Hirschfeld. *Archiv der Heilkunde*, 1871, p. 191.

CHAPTER X.

INFLAMMATORY AFFECTIONS OF THE APPENDIX—TERMINOLOGY.

THE most important pathological lesions of the vermiform appendix are undoubtedly those of an inflammatory character. Such affections are of the deepest interest and greatest practical importance alike to physicians and surgeons. And yet, until within the last few years, true inflammation of the appendix has generally been considered a comparatively rare and unimportant affection. This was doubtless because its varying manifestations were not clearly recognised, or else looked upon as due to morbid processes elsewhere. At the present day we, however, know that appendicitis, in its various forms, is of very frequent occurrence.

While a recognition of the due importance of primary inflammatory affections of the appendix has no doubt been mainly due to lack of accurate pathological observation, a lax and very imperfect terminology has in great measure tended to divert attention from the essential structure involved.

Inflammatory conditions, involving the right iliac fossa, have probably occurred as long as man has been the subject of pathological lesions. To the older physicians such were known as "phlegmon of the iliac fossa."[1]

In 1838, Albers[2] appears to have been the first to introduce the term "typhlitis," believing that these cases were usually due to an enteritis limited to the cæcum. He went so far as to describe four distinct varieties.

1. Stercoral typhlitis, arising from the irritation of accumulated fæcal matter.

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[1] MÉNIÈRE. "Tumeurs phlegmoneuses occupant la fosse iliaque droite."—*Arch. de Méd.*, 1828, XVII., and GRISSOLLE. "Tumeurs phlegmoneuses des fosses iliaques."—*Arch. de Méd.*, 1839.

[2] ALBERS. "Beobachtungen auf dem Gebiete der Path. und path. Anat." Bonn. 1838.

2. Simple typhlitis, set up by the various agents which usually excite an ordinary catarrhal inflammation of the intestinal mucosa.

3. Peri-typhlitis, when the inflammation of the mucosa extended to the peritoneum covering the cæcum and to the neighbouring parts.

4. Chronic typhlitis, where the inflammatory process advances slowly and lasts a considerable time.

Numerous later writers have followed, more or less closely, the classification of Albers. Some have even attempted to show that the inflammatory condition originated not in the cæcum itself, but in the peri-cæcal cellular tissue, quite neglectful of the fact that usually there is but little connective tissue behind the cæcum, and in some cases none.

The terms now commonly met with are—

1. Typhlitis, signifying a true inflammatory condition of the walls of the cæcum—in fact, a cæcitis.

2. Peri-typhlitis, where the inflammation of the cæcum has extended so as to involve the surrounding peritoneum.

3. Para-typhlitis, indicating an inflammation of the cellular tissue surrounding the cæcum.

4. Appendicitis, where the primary inflammation originates in the vermiform appendix.

5. Peri-appendicitis, where the inflammatory condition has spread to the surrounding peritoneum.

But, while the above definitions appear fairly reasonable, many authors use these various terms with the greatest laxity. We need but indicate the following examples:—

According to Ziegler,[1] "typhlitis" and "peri-typhlitis" imply "inflammation of the vermiform appendage and the parts around it."

Fagge,[2] while clearly recognising that the appendix is frequently the initial seat of the mischief, uses the term "typhlitis" throughout his description, although he suggests no distin-

[1] Ziegler. "Text-book of Pathological Anatomy," 2nd English edition, Part II., p. 286.

[2] Fagge. "Principles and Practice of Medicine," 2nd edition, II., p. 385.

guishing term for those instances where the cæcum might be thought to be the starting point. As regards the term "peri-typhlitis" he is still more vague, stating that "It appears that in the common use of the term 'peri-typhlitis' there is in reality no intention to limit it to cases in which the connective tissue behind the bowels is the exact seat of the disease, but rather an unacknowledged feeling that the term has a wider signification than typhlitis, and means that the disease is 'about' or 'in the neighbourhood of' the cæcum."

As regards the term "peri-typhlitis," while Virchow recommends that it denote an inflammation of the serous membrane covering the cæcum, a surgeon like Sands[1] understands by it "all inflammatory processes starting from the cæcum or vermiform appendix which lead to the development of a circumscribed tumour."

Coats,[2] in speaking of "typhlitis" and "perityphlitis," says, "These two terms mean respectively inflammation in and around the cæcum, but they are frequently used so as to include inflammations in connection with the vermiform appendage."

Wilks and Moxon,[3] after stating that "When an inflammatory process has been confined to the coats of the gut itself, the term *cæcitis* or *typhlitis* has been given, and when the cellular tissue around is involved, *perityphlitis*," go on to add, "It is not clear, however, that any one particular form of disease is here intended by those who make use of these expressions."

Whatever the term "perityphlitis" was originally intended to indicate in the pathologist's mind, it now probably most readily suggests an encysted abscess of appendicular origin. It should also be remembered that an extensive inflammation of either cæcum or appendix can hardly exist without involvement of the serous coats, and, therefore, the names "peri-typhlitis" and "peri-appendicitis" used in their restricted sense are somewhat superfluous.

As regards the term "typhlitis," it, as at present used, has

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[1] Sands. *New York Medical Journal*, XLVII., p. 199.

[2] Coats. "Manual of Pathology," 2nd edition, 1889, p. 740.

[3] Wilks and Moxon. "Lectures on Pathological Anatomy," 2nd edition, p. 407.

certainly no definite meaning. Thus, for example, Sir Dyce Duckworth[1] clearly states, "I employ the term 'typhlitis' as a generic one to indicate all inflammatory affections of the cæcum, appendix, and their immediate investments."

And yet, as the result of my observations in the post-mortem room and elsewhere, and from a careful study of the literature of the subject, I am deeply impressed with the necessity for a greater exactness and more convenient uniformity in our nomenclature. Taking the subject from a pathological standpoint it appears reasonable that the most desirable names are those which immediately indicate the morbid condition of the parts involved, and their position and condition as regards treatment. I would, therefore, suggest the use of such terms as "appendicitis" and "cæcitis"; and where there is involvement, as is usually the case, of the surrounding peritoneum, the terms "peri-appendicitis" and "peri-cæcitis"; and where there is extra-peritoneal inflammation, secondary to a "cæcitis," we might use the term "para-cæcitis."

Although the appendix is practically always an intra-peritoneal organ, it certainly sometimes gives rise to a secondary inflammation in the extra-peritoneal cellular tissue. Such a condition is best spoken of as a "cellulitis" of appendicular origin.

If a clinical term be necessary for this group of cases, perhaps the name "typhlitis" might be retained, provided, however, that it be employed in some such manner as indicated by Sir Dyce Duckworth. But whatever names we may adopt the fact nevertheless remains that the vast majority of these cases are really due to appendicitis. Thus "appendicitis," although not an altogether satisfactory term, is perhaps the most correct we can employ with our present knowledge of the pathology of the majority of these cases.

While, however, strongly convinced that far and away the larger number of the cases of inflammation in the right iliac region are appendicular in origin, I would very definitely point

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[1] Duckworth. *Lancet*, October 6, 1888, p. 651.

out that I cannot agree with the large number of Trans-Atlantic observers who claim that every case of so-called peri-typhlitic inflammation is primarily one of appendicitis.

Einhorn,[1] from an analysis of the cases met with among the 18,000 examinations made at the Munich Pathological Institute, between the years 1854-89, finds that "peri-typhlitis" of appendicular origin occurred in 91 per cent, while primary perforation of the cæcum was met with in only nine per cent.

Probably McBurney is not far wrong when he states that the appendix is the seat of the primary trouble in 99 per cent of the cases.

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[1] Einhorn. *Münch. med. Woch*, 1891, p. 121, 140.

CHAPTER XI.

INFLAMMATORY AFFECTIONS OF THE APPENDIX—VARIETIES OF APPENDICITIS.

APPENDICITIS may, just as is the case with enteritis, present a most varied pathology. Thus we have variations in the character of onset, in the severity and rapidity of progress, in its symptomatology, and in the ætiological factors initiating the morbid process. Considerable difference also occurs as to the seat and extent of involvement, and an often most perplexing clinical multiformity results from varying degrees of previous inflammation, which, while in certain cases predisposing to a recurrence, in other instances tends to bring about curative results by the obliteration of the appendix itself, or by a limiting of the inflammatory mischief through the formation of barricades of protecting adhesions. Hence the necessity for some definite classification of appendicitis has been felt by most of the careful observers who have interested themselves in the inflammatory processes of this apparently insignificant intestinal appendage.

With, of Copenhagen, recognising the paramount importance of the peritoneal involvement in the pathology of these cases, describes three forms, which practically may be grouped under the following heads:—

1. Appendicitis with adhesive peritonitis.
2. Appendicitis with local or circumscribed peritonitis.
3. Appendicitis with diffuse or general peritonitis.

Talamon,[1] from a physician's point of view, enumerates four clinical forms:—

1. Acute perforating appendicitis.
2. Sub-acute appendicitis, with slowly occurring perforation.

[1] TALAMON. "Appendicite et Pérityphlite." *La Médecine Moderne*, November 13, 1890.

3. Simple appendicitis, with colic.

4. Relapsing appendicitis.

Keen[1] mentions five varieties:—

1. Mild appendicitis, usually ending in resolution without the formation of an abscess.

2. Perforative appendicitis, followed by general peritonitis.

3. Perforation of the appendix and formation of a local or "comfortable" or "comparatively safe" (McBurney) abscess.

4. Appendicitis with formation of a very chronic abscess which may last for months.

5. Recurrent appendicitis.

Greig Smith[2] simply groups them into three classes:—

1. Perforative appendicitis.

2. Purulent appendicitis.

3. Plastic appendicitis.

Quite recently, Poncet and Jaboulay[3] have suggested a classification, which, while being unnecessarily complex, is also open to grave objections on pathological grounds.

They divide all cases into two groups—acute and chronic.

I. The acute are further grouped into two classes, depending on the relation of the appendix to the peritoneum: (1) Acute anterior (intra-peritoneal), and (2) acute posterior (extra-peritoneal).

The (1) acute anterior or intra-peritoneal forms are of four varieties:—

(i.) Appendicitis with perforation and gangrene, accompanied with a diffuse suppurative peritonitis.

(ii.) Appendicitis with perforation and gangrene, leading to a localised suppurative peritonitis.

(iii.) Infectious appendicitis, with generalised peritonitis, without perforation or gangrene of the appendix.

(iv.) Appendicitis with peri-appendicular suppuration and sero-fibrinous effusion into the peritoneal cavity.

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[1] Keen. *Annals of Surgery*, XIII., 1891, p. 255.

[2] Smith (Greig). "Abdominal Surgery," 4th Edit., p. 764.

[3] Poncet and Jaboulay. "Vingt-sept Observations d'Appendicites." *Revue de Chirurgie*, November, 1892, p. 947.

(2) The acute posterior or extra-peritoneal form leads to the formation of suppuration in the lumbar or iliac regions.

II. The chronic forms are also divided into: (1) The chronic anterior or intra-peritoneal, including the so-called "recurrent" appendicitis, and (2) the chronic posterior or extra-peritoneal.

In the following pages I intend to adopt a very simple grouping of appendicitis, but one which, I believe, is pathologically correct and clinically useful:—

1. Simple appendicitis.
2. Perforative appendicitis.
3. Recurrent appendicitis.

The group of perforative appendicitis is further divided into several important varieties, as indicated in Chapter XIII.

In addition to the above there are certain *specific* forms of appendicitis, which I have dealt with in separate chapters. These are:—

1. Tubercular appendicitis.
2. Typhoid appendicitis.
3. Actinomycotic appendicitis.

CHAPTER XII.

SIMPLE APPENDICITIS.

JUST as we frequently get a so-called simple inflammation of the stomach or intestines resulting often from some slight local irritation, so we may also have a mild form of appendicitis. Numerous names have been suggested for this variety, such as "catarrhal," "mild," "simple," or "parietal."

Comparatively little is known, however, as to its exact pathology. Undoubtedly it does frequently occur, and is almost always, I believe, the first stage of the more severe varieties. A catarrh of the appendix most probably is the initial factor in the production of many appendical concretions. By it the normal peristaltic movements of the appendix are limited or annulled, and with abnormal secretion of its mucous membrane, in presence of fæcal matter, all the elements for the formation of a concretion are provided.

The term "catarrhal" is certainly the most open to objection. It usually suggests a superficial inflammatory process limited to a mucous surface. To any one who has the slightest knowledge of the histological structure of the appendix, it must appear most improbable that catarrhal appendicitis ever occurs in this limited sense, for, as might be expected in all of these mild cases, more or less of the whole of the appendicular walls appear to be involved. Microscopic examination of appendices removed early by operative interference have shown this to be the case.[1]

In many instances these forms of simple or mild appendicitis are unassociated with any symptoms sufficiently definite to make their recognition a clinical certainty.

Several observers have devoted particular attention to the pathological evidences of mild forms of appendicitis.

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[1] TALAMON. "Appendicite et Périty plite," p. 60.

Toft,[1] according to With, found morbid changes in the appendix in 110 out of 300 cases examined during the course of post-mortem examinations.

Tüngel,[2] also, according to Matterstock, in examinations made at the Hamburg Hospital, during a period of two years, found, in addition to cases of true perforation, 30 instances of partial or complete obliteration of the appendix, 43 cases of catarrh and fæcal concretions, and 12 of abnormal adhesions.

Kraussold even goes so far as to state that 33 per cent of all adult bodies show evidences of appendicular disease.

The experience of the above observers appears to have been somewhat exceptional. Certainly evidences of old inflammatory disease of the vermiform appendix are frequently met with; but it seems impossible to assume, as has been done, that something like one-third of all adults have had one or more attacks of appendicitis.

I have paid particular attention to this point in the course of my pathological examinations at the Manchester Royal Infirmary and elsewhere, and I am convinced that, speaking generally, the above statistics are far too high. After a careful observation of the conditions of the appendix in a large number of cases of both sexes, and at all ages, I have been driven to the conclusion that many of the very variable peritoneal attachments, which are strictly non-inflammatory and of developmental origin, have been mistaken for evidences of old inflammatory adhesions. A differentiation between the two is by no means always easy.

I believe the numbers given by Ransohoff[3] fairly represent the usual proportion. This author, in an examination of over 60 bodies, detected lesions pointing to previous inflammatory involvement of the appendix in only 8, death being in all these cases unconnected with the appendix.

Certainly severe or even well-marked forms of appendicitis do not appear to have been very frequent in at least this part

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[1] Toft. *Nordeskt. Med. Arke*, VII., 1. *London Medical Record*, 1880, VIII., 213

[2] Tüngel. *Gerhardt's Handbuch der Kinderkrankh.*, 1880, IV. 2, p. 897.

[3] Ransohoff. *Trans. Amer. Surg. Ass.*, VIII., 1890, 151.

of the country during past years. For in a most careful examination of our post-mortem records of cases occurring prior to the beginning of 1890, I can find but very few instances where the fatal termination could be considered as due to true primary disease of the appendix. In a number of these cases the exact pathology is somewhat doubtful; but as they present many features of considerable interest, I have ventured to append the following brief abstracts:—

Case.[1]—Samuel M——, aged 20, presented symptoms of intestinal obstruction. At the post-mortem examination, torsion of the lower part of the ileum with acute peritonitis was found. The lower two inches of the ileum were bound down by old adhesions, and an abscess had formed behind this portion of the ileum and the cæcum. It contained thick pus, which had no fæcal odour. There was no perforation of the bowel. The condition of the appendix is not mentioned.

This case is indexed as "peri-cæcal abscess," and although no reference is made to the possibility of the appendix being the primary seat of the mischief, yet, judging from the whole report, it seems quite probable that such may have indeed been the case.

Case.[2]—Thomas F——, a lad of 16, where death was due to pyæmia. The cæcum was "almost entirely ulcerated. The edges of all the ulcerations were thickened, ragged, and overhanging, while the floor was also ragged and irregular." No foreign body was found in the cæcum. The vermiform appendix was tied down by adhesions to the cæcum. The remainder of the large intestine was healthy. Pyæmic abscesses were present in the kidneys and spleen. The post-mortem examination was conducted by Dr. Robert Maguire, then Pathologist to the Infirmary.

This case of ulcerative cæcitis is of considerable interest, for it is a clear example of how pyæmic infection may arise from ulcerative processes in this part of the intestinal tract. The vermiform appendix, although involved, was not apparently the primary seat of the mischief.

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[1] *Manchester Royal Infirmary Post-mortem Reports*—Surgical. Vol. 1881, p. 116, No. 48.

[2] *Manchester Royal Infirmary Post-mortem Reports*—Surgical. Vol. 1881, p. 175, No. 67.

Case.[1]—Elizabeth W——, aged 71, death from cardiac dilatation. "The cæcum and adjacent part of the ascending colon were bound down to the posterior abdominal wall by some firm, old fibrous tissue, in which the ureter was embedded." The right kidney was much atrophied, weighing only $1\frac{3}{4}$oz., and its pelvis was dilated. The left kidney was 4oz. in weight, and appeared perfectly healthy. No mention is made as to the condition of the appendix, but the pathological condition is indexed as "old peri-typhlitis." The post-mortem examination was made by Dr. Thomas Harris, then Pathologist to the Infirmary.

This case is very interesting as showing how a "peri-typhlitis" may cause obstruction to the right ureter, so bringing about very marked renal atrophy.

Case.[2]—Edward O'N——, æt. 19, death from extensive tuberculosis. Here was a condition indexed as "old peri-typhlitis." Behind the cæcum was a considerable thickening of tissue, amongst which were small irregular spaces containing feculent matter. They communicated with the lower part of the ileum. No description is given as to any abnormal condition of the cæcum or appendix.

In this case it is impossible to say whether the "peri-typhlitis" had any connection with the appendix. More probably it arose from tubercular ulceration in the cæcum or lower portion of the ileum.

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[1] *Manchester Royal Infirmary Post-mortem Reports*—Medical. Vol. 1884, p. 475, No. 161.

[2] *Manchester Royal Infirmary Post-mortem Reports*—Medical. Vol. 1886, p. 552, No. 230.

CHAPTER XIII.

PERFORATIVE APPENDICITIS.—VARIETIES.

THE importance of inflammatory lesions of the appendix mainly arises from its close connection with the peritoneum. This fact is not only of deepest interest to the pathologist, but is ever to be remembered by physician and surgeon as of paramount importance.

In perforative appendicitis the inflammatory process leads to the formation of a communication between the interior of the vermiform appendix and the cavity of the peritoneum. This communication may vary considerably in size, shape, situation, and in the rapidity of its formation. Moreover, previous or slowly progressing inflammation may have led to the formation of more or less protective adhesions, which either limit the extent of the perforation or circumscribe the peritoneal area into which such may occur.

Again, the quantity and character of the appendicular contents at the time of perforation are points of considerable pathological importance.

Free mobility and unusual length also undoubtedly favour a free extravasation.

The position of the appendix is, as has previously been shown, of much importance. When tied down by old adhesions, placed in a retro-cæcal position, or situated within a peritoneal pouch, the irritating appendicular contents escaping through the perforation will naturally be less likely to undergo a rapid or general diffusion, and the possibility of peristaltic movements of the appendix aiding this diffusion will be rendered practically impossible.

These and the like considerations are all of the greatest moment in shaping, as it were, the character of the perforative appendicitis.

Probably no classification can meet all requirements.

After a careful study of the cases which have come under my observation, and bearing in mind the main anatomical variations, together with the all-important pathological consideration of the *peritoneal involvement,* I would suggest the following classification as both simple and accurate:—

(1) Perforative appendicitis with diffuse peritonitis.

(2) Perforative appendicitis with localised peritonitis.

(3) Perforative appendicitis with extra-peritoneal suppuration.

Some might prefer a classification into—

(1) Acute, and (2) Chronic Perforative Appendicitis, with further divisions as to the character and extent of the peritoneal involvement. Such, however, appears to me hardly accurate, for the actual perforation usually occurs in an exceedingly brief space of time, although the inflammatory process leading up to it may have been a most chronic and slowly progressive one.

And, indeed, as is well known clinically, during life when no distinct previous history may be available, it is often impossible to ascertain if the perforation has occurred during the course of a more or less chronic appendicitis, or whether it is due to the rupture of a rapidly developed gangrenous appendicitis.

CHAPTER XIV.

PERFORATIVE APPENDICITIS.—ÆTIOLOGICAL FACTORS.

BEFORE proceeding to a separate consideration of the several varieties of perforative appendicitis, a reference to certain ætiological factors in its production is desirable.

Sex.—It is a remarkable fact that perforative appendicitis is far more frequent in the male than in the female. This was clearly pointed out by Crisp[1] as far back as 1859. In five cases in which he had observed perforation all the patients were males.

The results of analysis made by different authors are indicated in the following table:—

Author.	No. of Cases.	No. of Males.	No. of Females.	Percentage of Males.[2]	Percentage of Females.[2]
Bamberger	73	54	19	74	26
Fenwick	105	80	25	74	24
Fitz	247	197	50	80	20
Marchal	36	32	4	89	11
Maurin	94	78	16	83	17
Paulier	49	36	13	73	26
Pravaz	392	295	97	75	25
Volz	56	37	9	66	16

Talamon gives a percentage of 79 for males and 21 for females.

Among the fatal cases occurring in the Manchester Infirmary and subsequently to be referred to, 7 occurred in males, and only 1 in a female. These give a percentage of 88 in man, and 12 in woman, thus fairly closely agreeing with the conclusions of those who have collected a large number of examples.

It seems impossible at present to offer any adequate explana-

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[1] Crisp. *Trans. Path. Soc. London*, X., 1859, p. 152.

[2] In estimating these percentages I have for convenience of comparison neglected fractional parts.

tion for this most striking difference in frequency between the male and female. As far as I have been able to form an opinion there is no definite anatomical or histological difference sufficient to afford a satisfactory solution of the problem.

Some have suggested that the male sex was more liable to exposure to strain and other forms of injury. But in the majority of instances, as is shown below, there appears to be no ground for believing that traumatism is of any great importance as an ætiological factor.

It is also interesting here to note that Fenwick in an analysis of a large number of cases collected from the reports of various authors found that where a perforative appendicitis appeared to be of tubercular origin, 41 per cent were females; while in perforation occuring in the course of typhoid all the records in which sex was mentioned proved to be females.

Crisp[1] says, "I am inclined to think that the greater and more extended motion of the right lower limb, in males, which to some extent must affect the contents of the cæcum, is the most probable cause." But as far as I can judge there is but little evidence to show that males do exercise "greater" or "more extended motion of the right lower limb."

It has also been stated that a catarrhal cæcitis leading to obstruction to the appendico-cæcal aperture is more frequent in the male than in the opposite sex. Of this I think there is no proof; indeed judging from the greater frequency of constipation in the female it might be more probable if the suggestion were reversed as far as the sexes go.

Age.—Perforative appendicitis is distinctly a disease mainly of early life.

The earliest case on record is that of Fenger,[2] which occurred in an infant of seven weeks. The appendix contained several hard fæcal concretions. There was general peritonitis.

Other cases occurring at a very early age have been recorded by Silbermann, Matterstock, Summers, and Monks.

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[1] Crisp. *Trans. Path. Soc. London*, X., 1859, p. 152.

[2] Fenger. "Cyclop. of Diseases of Children."

Crisp[1] in his analysis of 32 cases of perforative appendicitis found the following results as regards age.

Age.	No. of Cases.	Percentage.
Under 10	5	15
10 to 20	13	40
20 to 40	7	22
40 to 60	7	22

The earliest statistics recorded as regards age appear to be those of Bamberger.

In an analysis of 73 cases he found—

Age.	No. of Cases.	Percentage.
Below 2 years	2	$2\frac{1}{2}$
Between 15 years and 20	20	27
„ 20 „ 30	32	44
„ 30 „ 40	9	12
„ 40 „ 50	5	7
Above 50	5	7

Fitz has analysed 228 cases with the following result :—

Age.	No. of Cases.	Percentage.
From 20 months to 10 years	22	10
From 10 years to 20 years	86	38
„ 20 „ 30 „	65	28
„ 30 „ 40 „	34	15
„ 40 „ 50 „	8	3
„ 50 „ 60 „	11	5
„ 60 „ 70 „	1	$\frac{1}{2}$
„ 70 „ 78 „	1	$\frac{1}{2}$

Thus 173 cases or 76 per cent of the entire number were under 40 years, and nearly 50 per cent were under the age of 20 years.

Fenwick,[2] from an analysis of 97 cases, gives the following results :—

Age.	No. of Cases.	Percentage.[3]
Under 10 years	9	9
10 years to 20 years	29	29
20 „ 30 „	21	22
30 „ 40 „	16	16
Above 40	22	23
Total	97	

[1] Crisp. *Trans. Path. Soc. London*, X., 1859, p. 152.

[2] Fenwick. "Clinical Lectures," p. 12.

[3] In estimating the percentage in the above returns I have given them as whole numbers and disregarded small fractions.

Half of the cases under ten occurred in patients under five years of age.

Of the 8 cases which have been met with in the Post-Mortem Theatre of our Hospital the average age was 14. The only female was a child of 7, and this with a male of 7 were the two youngest cases. The oldest was a youth of 23. The others were aged 12, 15, 17, 18, and 22.

Numerous suggestions have been brought forward to explain this frequent occurrence during youth.

The real reasons, I believe, depend upon the well-recognised tendency for lymphoid tissue to become the seat of inflammatory processes in early life. The appendix is usually very rich in such lymphoid structure, as has already been indicated, and it would seem that in early life it is much more liable to acute and rapidly extending inflammation than is the case in adult or advanced life.

Concretions and Foreign Bodies.—The influence of fæcal concretions and foreign bodies in the production of appendicitis has already been shown (Chap. IX.) to be of considerable importance, and need not be further dealt with.

Reference may perhaps be here best made to the result of my inquiries as to the occurrence of foreign bodies or concretions in the appendices of insane patients.

Since lunatics are often given to swallowing foreign bodies it might therefore be thought that appendicitis was in them of more frequent occurrence than in general hospital cases. But I find that instead of a greater liability to appendicitis, such condition appears to be very rarely met with in lunatic asylums.

Dr. Shuttleworth, of the Royal Albert Asylum, at Lancaster, who has very kindly examined for me the Post-Mortem Records of that institution, states that no case is there recorded of perforative appendicitis.

Dr. Beadles, of the London County Lunatic Asylum, at Colney Hatch, also informs me that in his experience there is no reason to believe that the vermiform appendix is more liable to disease in the insane than in the sane.

In like manner my friend Dr. Goodall, Pathologist at the West Riding Asylum, Wakefield, believes that foreign bodies and the condition of perforative appendicitis are not more frequently met with in asylums for the insane than among general cases.

Traumatism.—The occurrence of some form of injury, such as a fall, a blow, or a severe strain, is sometimes noted as immediately preceding the onset of an attack of perforative appendicitis.

Thus Fitz, among the 257 cases collected by him, found that 19 were supposed to have received an injury, the result rather of indirect than direct violence; of these 9 were thought to be due to lifting a heavy weight, and 10 followed a fall or blow.

In the case of George D. (page 99), the fatal attack of appendicitis followed a severe shaking. As he had undoubtedly been the subject of previous inflammatory disease of the appendix, it appears very probable that in this instance, violence, such as he experienced, was quite sufficient to set up a fresh attack.

But against the probability of injury being anything like a frequent cause, is the fact that perforation is far more common in early life, when there would appear to be less liability to severe strain.

And were injury anything like a common cause, the female, exposed to the risks of pressure and strain consequent on pregnancy, might have been thought liable to appendicitis. But such is not the case.

Wiggin[1] has indeed recorded a fatal case of perforative appendicitis occurring during pregnancy. Such exceptional cases are of much interest, not so much from being in any way causally connected, as from their difficulties of accurate diagnosis.

In some cases, however, the occurence of perforation in an already gangrenous appendix is certainly hastened, if not actually produced, by some strain or injury producing increased

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[1] Wiggin. *Medical Record*, Jan. 23, 1892, p. 109.

movement of, or traction on the diseased part. Thus in the case of Hannah B. (page 106), there was a distinct history of severe straining at stool immediately before the onset of the symptoms of perforation.

But in far the majority of the cases I have had opportunity of investigating, there has been no ground to believe that traumatism played any important part as an ætiological factor.

Digestive Disturbances.—Digestive disturbances, such as prolonged constipation, diarrhœa, or vomiting, are occasionally said to precede an attack of acute appendicitis. Fenwick out of 43 collected cases of perforative appendicitis, where the previous state of the health had been recorded, found that only in 3 instances had there been any definite constipated state of the bowels.

It is difficult to ascertain to what extent these digestive disturbances may aid in the production of appendicular inflammation. It is, however, clear that many who are the subjects of long standing digestive troubles altogether escape the perils of appendicitis. It is also probable that many of the attacks of so-called "bilious vomiting" which have preceded an attack of appendicitis, may really have been indications of early or slight inflammatory conditions of the appendix.

Sutherland[1] has recently attempted to show that a close relationship exists in children between appendicitis and the uric acid diathesis. He has frequently met with excessive quantities of uric acid and oxalates in the urine of children the subjects of such inflammation.

Micro-organisms.—Recent researches have clearly shown that certain micro-organisms are to be looked upon as the constant occupants of the vermiform appendix.

Thus Ribbert and Bizozzero[2] have shown that the cells of what may be looked upon as the appendix of the healthy rabbit contain enormous numbers of degenerated micro-organisms.

Armand Ruffer[3] also states that he has counted more than

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[1] Sutherland. *British Medical Journal*, April 23, 1892.

[2] Ribbert and Bizozzero. *Centralbl. f. Bakt.*, 1885.

[3] Ruffer (A). "On the Phagocytes of the Alimentary Canal."—*Quart. Jour. Micros. Sci.*, Jan., 1890, p. 489.

two hundred micro-organisms in a single field of the deeper layers of the vermiform appendix.

The *bacterium coli commune* is said to be almost invariably present in every appendix. According to Clado it is the only microbe which is constant.

As long as the appendicular mucosa is sound these micro-organisms probably produce no ill effects; but when from some catarrhal condition, or direct injury, such as from the pressure of a concretion or foreign body, the nutrition of the elements forming the walls of the appendix is lowered or arrested, these agents appear capable of bringing about a most acute and gangrenous inflammatory condition.

Adenot[1] has submitted the pus from several cases of appendicular perforative peritonitis to bacteriological examination. The *bacterium coli commune* was found in each case. In one instance the *staphylococcus pyogenes aureus* was also present, but this case seems to have been a tubercular one.

Jalaguier,[2] in the pus of a case of suppurative appendicitis, found the *bacterium coli commune,* the *staphylococcus pyogenes aureus,* the *bacillus subtilis,* and a number of others.

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[1] Adenot. "L'Appendicite et le Bacterium Coli Commune." — *Comp. Rend. Heb. des Séances et Mémoires de la Soc. de Biologie,* 1891, p. 740.

[2] Jalaguier. *Revue de Chirurgie,* 10 Juillet, 1892, p. 633.

CHAPTER XV.

PERFORATIVE APPENDICITIS WITH DIFFUSE PERITONITIS.

OF all the varieties of appendicitis, perforative appendicitis with generalised peritonitis is, perhaps, of most importance, and of greatest interest to the clinician and the pathologist. It forms a distinct type of case, presenting characteristic clinical features, and running a more or less definite course. Its onset and progress is usually acute, and unless arrested by surgical interference, its termination is almost invariably fatal.

Perforative appendicitis may occur in an already diseased appendix. It may arise during the course of a chronic catarrhal appendicitis, or it may supervene in the so-called "recurrent appendicitis." But perhaps most frequently it arises as an acute affection in a hitherto normal appendix, and in these instances it would appear to run a more severe and rapid course.

Each case usually presents two stages which, while pathologically quite distinct, can only in a certain number of instances be separated clinically.

(1) *The Stage of Gangrenous Appendicitis.*—This is the time during which the appendicular walls are undergoing more or less rapid necrosis. It is the period preceding perforation, and is commonly marked by the occurrence of pain of varying severity, but, generally, most marked in the right iliac region. This pain is sometimes spoken of as "appendicular colic."

The first stage usually lasts from one to three days, but occasionally perforation may be long delayed.

(2) *The Stage of Perforative Peritonitis.*—The commencement of this period is usually signalised by a sudden onset of intense pain, occurring, apparently, at the time of perforation, and, doubtless, indicating the beginning of an acute peritonitis.

Fitz[1] has attempted to ascertain the date of occurrence of

[1] Fitz. "Perforating Inflammation of the Vermiform Appendix." *Trans. of the Assoc. of American Physicians*, I., 1886, p. 120.

this most important symptom. In an analysis of 61 cases he obtained the following results :—

Time.	Cases.	Per Cent.
On the 1st day	41	67
„ 2nd „	5	8
„ 3rd „	12	20
„ 4th „	2	3
„ 5th „	1	2

These statistics not being open to absolute proof can only be of relative value.

The case now takes on the well-marked features of an acute suppurative peritonitis, and general sepsis occurs with more or less rapidity. Sometimes septic infection occurs so quickly that death may thereby result almost at once. Such cases may truly be spoken of as "fulminating" perforative appendicitis.

In the ordinary course of the affection death most commonly occurs between the fifth and eighth day.

Fitz[1] in his analysis of 176 cases found the day of death was as follows :—

Day of Death.	No. of Cases.	Percentage.
On the 2nd day	8	4
„ 3rd „	20	11
„ 4th „	12	7
„ 5th „	20	11
„ 6th „	16	9
„ 7th „	22	12
„ 8th „	21	12
„ 9th „	10	6
„ 10th „	8	4
„ 11th „	6	3
„ 12th „	4	2
„ 13th „	4	2
„ 14th „	1	0
„ 15th „	3	0
„ 17th „	1	0
„ 18th „	1	0
„ 19th „	1	0
„ 20th „	2	0
In the 4th week	7	4
„ 5th „	4	2
„ 7th „	4	2
„ 8th „	1	0·5

[1] Fitz. *Loc. cit.* p. 126.

Thus, 56 per cent of the cases proved fatal within the first week; 31 per cent during the second week; and only 4 per cent lasted to the third week. It seems probable that in many of these cases the peritonitis was partial or more or less localised.

It is interesting to note that Crisp,[1] writing in 1859, records the case of a boy aged 12, where the onset occurred on January 10th, and death did not result till February 5th. At the autopsy, general suppurative peritonitis was found, and the appendix presented a perforation half an inch from its extremity.

Sometimes death occurs more or less suddenly. Thus Poland[2] mentions the case of a girl, aged 12, who, after a few days of general weakness and loss of appetite, was found dead in bed. There was extensive puriform peritonitis, and ulceration of the appendix, in which was found a small leaden foreign body, making its way through.

Rather than enter into a detailed consideration of the clinical and pathological features of these cases, it seems much more desirable to present them as they are met with in actual instances. I have, therefore, here brought together the notes of such cases as I have had opportunities of investigating.

One of the first cases I had the opportunity of carefully following came under my notice while House Physician to the Royal Infirmary. As regards sex, age, nature of onset, character of symptoms, and pathological appearances, the case was typical.

Case.—Acute Gangrenous Appendicitis: Perforation: Acute Diffuse Suppurative Peritonitis: Death: Necropsy.—William C——, a schoolboy aged twelve, was admitted to Yates ward of the Manchester Royal Infirmary, under the care of Dr. Graham Steell, on the afternoon of January 8th, presenting symptoms of acute peritonitis.

Clinical History.—On the previous Saturday night, January 4th, the patient, who had always enjoyed good health, went to bed as usual, apparently quite well. About 11 o'clock he got up and partook of a hearty supper of sausage and pork, together with some boiled peas. In about half an hour he was suddenly seized with violent abdominal pain,

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[1] Crisp. *Trans. Path. Soc. London*, X., 1859, p. 151.
[2] Poland. Quoted by Morris. "Ashhurst's Internat. Ency. Surg.," V., p. 993

which, according to his mother's account, did not appear to have been definitely localised in any particular region. Severe and persistent vomiting quickly followed. On Sunday morning half an ounce of castor oil was taken, and the bowels were subsequently relieved, but no blood was passed. Vomiting with constant abdominal pain continued. On Tuesday, January 7th, Dr. Blore visited the patient, and found him suffering from generalised abdominal pain, which had so increased by the following day that he was at once advised to come into hospital. On admission to the Infirmary, on January 8th, on the fourth day of his illness, he presented the usual symptoms of acute septic peritonitis. The face wore a pinched, haggard expression. He lay on his back, with the legs drawn upwards towards the body. The abdomen was very tense, due to the marked rigidity of the abdominal walls. Generalised pain was complained of, which was much increased by pressure. Periodical exacerbations occurred from time to time, causing such distress as to produce sharp cries of anguish. Vomiting persisted, almost every form of nourishment being quickly ejected. There was also frequent desire to defecate, but no motion was passed. Respiration was shallow, but not increased in rate, and almost entirely of superior costal type. There appeared to be instinctive opposition to the slightest diaphragmatic descent. The pulse was rapid, weak, and thready. Mental, as well as physical, prostration was pronounced, there being great restlessness and at times delirium. Scarcely any urine was passed.

The case was diagnosed as one of acute septic perforative peritonitis, due most probably to ulceration of the vermiform appendix. Surgical interference was not considered advisable, and a very bad prognosis was given, it being thought improbable that the case would last many days.

The patient was at once placed in a position affording the greatest opportunity for relaxation of the abdominal walls. Ice was given from time to time, and milk in small quantities to relieve the great thirst continually experienced. Two pills of calomel and opium were also given, and on the evening of the day of admission five minims of Battley's liquor opii sedativus were taken. A restless night was passed. The temperature, which on admission was 101·6°, fell to 99·2°. The following morning, January 9th, the temperature was still at 99·2°, and at 10 a.m. seven minims of Battley's solution was given. As, however, vomiting frequently occurred, further medication was carried on by hypodermic injections of morphia, repeated sufficiently often to keep him well under the influence of the drug. At night the temperature was

99·4°. By the morning of January 10th the temperature had fallen to 97·8°, and the patient appeared much more exhausted. No food could be retained. Complete constipation continued. Little or no urine was passed. Prostration became much more marked during the day, and the patient gradually sank, dying somewhat suddenly in the evening.

Autopsy.—A post-mortem examination was made on January 11th by my friend Dr. Wild, then Pathologist to the Royal Infirmary, and extracts from his report[1] state that the "peritoneum contained pus. The omentum, coils of intestine, and viscera were united together by thick layers of purulent lymph. Stomach normal. Intestines covered with lymph, normal in character. *Vermiform appendix* adherent to right iliac fossa, and presented a lateral perforation, one-eighth of an inch in diameter, and half an inch from its extremity, surrounded by recent adherent lymph. The tip of the appendix contained a nodule, the size and shape of a pea, consisting of hard brown fæces."

As far as can be ascertained in this case the inflammatory process was acute throughout, and starting in an appendix not previously the seat of any inflammatory mischief.

In the next case, although the fatal illness ran a very acute course, the appendix had previously been the seat of a mild inflammatory process on one or more occasions. The case also well illustrates the slight character of the symptoms which may occur during the first stage, with the consequent difficulty in forming a conclusive diagnosis.

Case.—Chronic Inflammatory Thickening of Appendix: Acute Gangrenous Appendicitis: Perforation: Acute General Peritonitis: Death.

Clinical History.—A young medical student, aged 21, apparently perfectly healthy, and accustomed to such active out-door exercises as tennis, boating, and hockey, first came under medical observation in the middle of the summer of 1891, with an attack of what seemed to be simple diarrhœa, just sufficiently troublesome to keep him at home for a few days. In August he was at the seaside, spending much time in

[1] *Manchester Royal Infirmary Post-mortem Reports*—Medical. Vol. 1889, p. 230, No. 120.

rowing, and appearing perfectly well. On October 1st he entered for his classes at a well-known medical school. On this day he complained of sore throat, but of nothing else. In the evening he experienced slight general abdominal pain, with some sickness, and his temperature rose to 100·2° F.

The following morning (October 2) the temperature was 100° F., and there was slight vomiting. In the afternoon the temperature had risen to 102°, and by the evening it stood at 103° F. Still no localised abdominal pain or tenderness could be detected.

On October 3rd he appeared much better. A very distinct membranous patch was, however, observed on the pillar of the fauces on the left side, and the urine contained albumen. Diphtheria was suspected. The temperature was 100° F., the pulse 92. On the evening of the same day the temperature registered 99·4° F., the pulse being 100. No fresh symptoms had developed.

The next day (October 4) he seemed considerably better. No abdominal symptoms were complained of. The temperature registered in the morning 98·5° F., with a pulse of 75; in the evening 99° F., and the pulse 84.

On October 5th abdominal uneasiness was present, but not amounting to distinct pain. The abdomen was uniformly distended, and there was slight fulness in the right iliac region. A sensation as of priapism was experienced, although no such condition existed. Complete constipation, which had continued since the commencement of the illness, still persisted. A glycerine suppository acted very slightly. During the afternoon vomiting became very marked, but there was no evidence of any collapse. When seen, however, at 9-30 p.m. he was found to be almost pulseless, but yet perfectly conscious, and in this condition he remained till death, which occurred at midnight.

For the notes from which I have prepared the above short clinical history I am indebted to Dr. Edwin Jackson, the patient's medical attendant, through whose kind permission I am enabled to record the case.

Autopsy.—The following day I made a post-mortem examination. The vermiform appendix, which was about four inches in length, was somewhat thickened and gangrenous. A large perforation existed at the junction of the distal with the middle third. There was little or no matting of tissues around the appendix, which lay in a collection of exceedingly foul fæcal pus. The whole peritoneal cavity was

in a condition of acute suppurative peritonitis. All the other organs of the body were quite healthy.

The following case is in many ways similar to the preceding one. The patient had been the subject of previous adhesive appendicitis, and the fatal acute gangrenous appendicitis appears to have been, in part at least, excited by the severe strain. In this case also the transition from the pre-perforative to the perforative stage was most marked, and occurred on what appears to have been the fifth day of the illness.

Case.—Chronic Appendicitis, with Old Inflammatory Peritoneal Adhesions : Strain : Acute Appendicitis : Perforation : Diffuse Septic Peritonitis : Laparotomy : Death.—George D., aged 15, a fitter, was admitted to the Royal Infirmary at 2 a.m. on Sunday, May 1st, presenting the characteristic signs of acute general peritonitis.

Clinical History.—About a week ago he was forcibly taken and hung by the legs, head downwards, over a man's back, and then given a severe shaking. He dates his illness from this occurrence. On the Monday, previous to his admission to hospital, he complained of feeling somewhat unwell, but went to work as usual on the Tuesday. On returning home, he experienced some abdominal discomfort, and had frequent desire to defæcate, but little or no motion was passed. Throughout Wednesday and Thursday he did not feel sufficiently well for work, was unable to take his food, and still complained of abdominal discomfort.

On Thursday night he commenced to vomit, and all food taken was immediately ejected.

About mid-day on Friday he suddenly became much worse. There was a sudden onset of acute pain in the abdomen, so intense that he screamed in agony. His mother is very distinct in describing this "sudden change." A medical man was now sent for.

On Saturday the patient was much worse. The vomiting had become fæculent, and a slight motion was passed of an intensely black colour. He was sent to the Infirmary early on Sunday morning.

According to his mother's account he had during the last twelve months had several bad attacks of vomiting, and several times had suffered from troublesome diarrhœa. He appears also to have usually been somewhat constipated. He was the tenth child in a family of eleven, nine of whom had died in infancy.

On admission to hospital there was found to be generalised abdominal

pain, becoming most acute on the slightest pressure, and particularly marked in the lower part of the abdomen. The abdominal walls were kept tense and rigid, but the legs were not drawn up. Fæcal vomiting was marked, and had been continuous since the previous day. The temperature was 101·4° F.

An hour after admission the abdomen was opened by Mr. Wright. The whole of the peritoneum was in a condition of acute suppurative peritonitis. At first only lymph and serum flowed out, but on making slight pressure a considerable quantity of stinking pus escaped. The abdominal cavity was then washed out, and in the washings was found a small bit of material which, although only about the size of a pin's head, looked like a piece of a nut. The cavity was freely drained and a large glass drainage tube inserted. The patient, who was in an advanced state of general sepsis, failed to rally, and died a little before 6 a.m.

Autopsy.[1]—At the post-mortem examination I found the following condition :—

The peritoneum was in a state of acute general purulent peritonitis. The pelvis and both iliac fossæ contained thick white creamy pus. The lower coils of the intestine were matted together, and covered with a recent deposit of thick yellowish white flaky lymph. The upper portion of the abdominal cavity was the part least involved. The stomach, duodenum, and intestines, although much congested, presented no perforation or ulceration.

The vermiform appendix was the seat of a "gangrenous" appendicitis. It was large and 9 cm. long, and arose from the cæcum by a broad base. It was directed inwards behind the ileum, lying under cover of the ileum and its mesentery. At about its middle it was adherent to the lower surface of the mesentery, which was also in this part considerably thickened. Here it was acutely flexed on itself, and followed a course directed downwards into the pelvis for a distance of 5 cm. The last 3 cm. of the appendix were firmly adherent to the pelvic peritoneum by what appeared to be adhesions of some long standing. At the point of its flexure and adhesion to the mesentery the appendix was gangrenous, and on its posterior surface, where it was exceptionally soft and most necrotic, there was a ragged perforation. Above the gangrenous portion the appendix contained nodules of

[1] *Manchester Royal Infirmary Post-mortem Reports*—Surgical. Vol. 1892, p. 49.

hardened fæces. The lower few cm. of the appendix were extremely congested, evidently presenting a stage just antecedent to gangrene.

The appearance of the vermiform appendix in its relation to surrounding parts, is shown in the accompanying illustration.[1]

From the attachment of the distal portion of the appendix to the peritoneum overlying the psoas muscle, it seems very probable that extensive contraction of the iliacus and psoas muscles would tend to drag it upwards, outwards, and to the right, thus producing some dragging on the kinked portion at its attachment to the mesentery above the terminal portion of

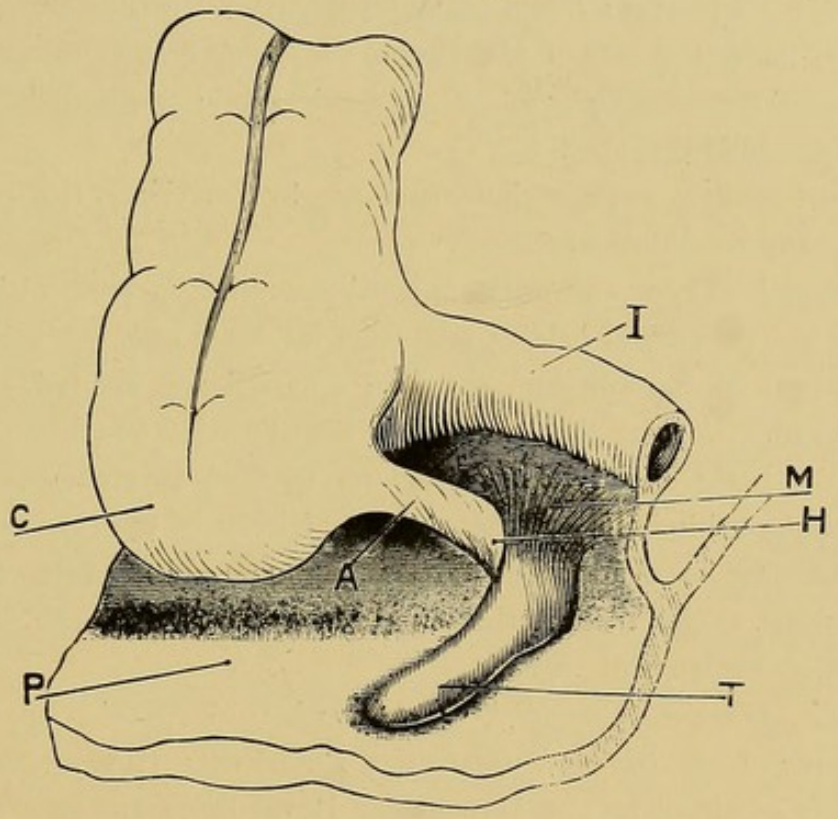

Fig. 19. Illustrating the position and condition of the vermiform appendix in the case of George D. C—Cæcum. I—Ileum, drawn upwards. A—Vermiform appendix. T—Terminal portion of the vermiform appendix, firmly adherent to peritoneum over right iliacus and psoas muscles. P—Peritoneum. M—Mesentery of the ileum with adhesions between it and the middle portion of the appendix. H—Indicates situation of commencement of flexion of the vermiform appendix and where on its posterior surface perforation had occurred.

the ileum. The latter would also, most probably, during violent or excessive peristalsis be drawn in an opposite direction—that is, upwards and to the left. This traction in divergent directions would tend to bring about a laceration in the already gangrenous appendix.

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[1] The above woodcut has been prepared from a pen and ink sketch made at the post-mortem examination by one of my clerks, Mr. F. J. H. Coutts. The specimen is preserved in the Pathological Collection of the Manchester Royal Infirmary, No. 144 W.

The cæcum was small, congested, but otherwise normal, and contained soft yellow fæces. All the other organs were healthy, except for the condition of general congestion.

The following cases, which have also been met with in our Infirmary Post-Mortem Theatre, further illustrate so well many of the chief pathological features of this group of appendicitis, that I here venture to briefly record them :—

Case.—Acute Gangrenous Appendicitis: Perforation: Acute Diffuse Suppurative Peritonitis: Death.—Daniel M., aged 7, was admitted to the Infirmary, under the care of Mr. Heath, on March 8th, 1886, presenting the characteristic symptoms of general septic peritonitis. Death occurred the following day.

A post-mortem examination was made by Dr. Harris the next day. The following condition was found :—

Autopsy.[1]—There was acute general suppurative peritonitis. The appendix was perforated half an inch from its distal end. A small, hard mass of fæces, of the size and shape of a horse-bean, was lodged in its proximal end. Beyond this concretion the appendix was dilated to the size of the little finger. There was no marked involvement of the cellular tissue behind the cæcum. The remainder of the intestines were normal, save for being adherent by their serous coats from deposition of serous lymph. The mesenteric glands were enlarged and firm, but presented no evidence of caseation.

Case.—Adhesive Appendicitis: Impaction of Fæcal Concrements: Perforation: Acute Diffuse Suppurative Peritonitis: Death.—Stanley P. æt. 18, was admitted to the Manchester Royal Infirmary on May 15th, 1888, under Mr. Heath, with symptoms of acute septic peritonitis. He died the same day.

The post-mortem examination was made the following day by Dr. Harris. The following is abstracted from his report :—

Autopsy.[2] —There was acute general suppurative peritonitis. The vermiform appendix presented a very minute perforation, which opened directly into the peritoneal cavity. The appendix was large and about half an inch in diameter, and adherent to the surrounding structures by yellowish lymph. It contained two pellets of very hard fæces, one the

[1] *Manchester Royal Infirmary Post-mortem Reports*—Surgical. Vol. 1881, p. 529, No. 191.

[2] *Manchester Royal Infirmary Post-mortem Reports*—Surgical. Vol. 1887, p. 76, No. 37.

size of a small marble, the other the size of a horse-bean. The latter was so smooth and hard as to present quite the appearance of a seed, and its true nature was only clearly demonstrated on splitting it in halves. The mucous membrane had a yellowish, sloughy appearance throughout its whole extent. It was also noted that the lower part of the ileum, for a distance of about two feet, but most marked in the immediate neighbourhood of the ileo-cæcal valve, presented very distinct enlargement of the solitary follicles and, to a less extent, the Peyer's patches also. There appears to have been no evidence of tuberculosis. The other organs were healthy.

Mr. William Thorburn[1] has published a most interesting case, which was recently under his care in the Royal Infirmary. In order to make my series of Manchester cases as complete as possible, I have ventured to abstract the most important details :—

Case.—Acute Gangrenous Appendicitis: Perforation: Acute General Peritonitis: Laparotomy: Death.—Samuel G., æt. 16, was admitted to the medical wards of the Infirmary on March 14th, 1890.

Clinical History.—On March 8th he had been engaged in some heavy lifting, after which he ate a hearty meal. Two hours later he experienced severe abdominal pain, radiating from the umbilicus. The following day vomiting set in, and continued until, on the 13th, it had become stercoraceous. Absolute constipation had continued throughout his illness, and purgative medicines and enemata had been administered without effect. Three years previously he had had an attack of "inflammation of the bowels," with constipation and severe pain in his right side.

On examination he was found to present the characteristic appearances of acute suppurative peritonitis. The lad was transferred to the surgical wards, and Mr. Thorburn performed the operation of laparotomy. There was general suppurative peritonitis. The vermiform appendix was free, projecting downwards and to the left, about one inch in length, with a square-cut, not a tapering, extremity. At its base was a perforation occupying about one-third of its circumference, and the whole mass was gangrenous. The peritoneal cavity was well irrigated and free drainage established. The appendix was brought up to the external wound. Death occurred seven hours after the operation.

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[1] Thorburn. "A case of perforation of the appendix vermiformis, with general peritonitis. Laparotomy."—*Medical Chronicle*, XII., p. 13.

Autopsy.[1]—Post-mortem examination was made by the Pathological Registrar, Dr. Wild. There was general acute suppurative peritonitis. The vermiform appendix[2] was adherent to the posterior surface of the cæcum. It presented a lateral perforation three-quarters of an inch in length and two-thirds of an inch in circumference, the part beyond being gangrenous. It contained a plug of hard fæces. The omentum contained a large caseous and calcareous gland. The other organs were healthy.

Case.—Acute Gangrenous Appendicitis: Perforation: Acute General Suppurative Peritonitis: Laparotomy; Death.—Samuel J., æt. 22, was admitted to the Manchester Infirmary, January 15th, 1891, under the care of Mr. Southam, presenting symptoms of acute peritonitis.

Clinical History.—A week ago he was seized with severe abdominal pain associated with nausea. During this time there has been complete constipation, and for the last five days vomiting has occurred.

Mr. Southam performed laparotomy shortly after the patient's admission. There was general suppurative peritonitis. The peritoneal cavity was well flushed out and drained. Death, however, occurred on the third day after the operation.

Autopsy.[3]—At the post-mortem examination the whole peritoneum was in a condition of acute suppurative peritonitis. The appendix[4] was of a dark slaty colour, and its walls were gangrenous and perforated at its lower end. No foreign body was found. The other organs were healthy.

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[1] *Manchester Royal Infirmary Post-mortem Reports*—Surgical. Vol. 1887, p. 381, No. 485.

[2] The specimen is preserved in the Pathological collection of the Manchester Royal Infirmary, No. 10 T.

[3] *Manchester Royal Infirmary Post-mortem Reports*—Surgical. Vol. 1887, p. 507, No. 249.

[4] The specimen is preserved in the Pathological collection of the Manchester Royal Infirmary, No 75 S.

CHAPTER XVI.

PERFORATIVE APPENDICITIS WITH LOCALISED PERITONITIS.

WHILE perforation of the stomach, duodenum, or intestine usually sets up a diffuse peritonitis, in very many instances of perforative appendicitis only a localised abscess results.

This is doubtless due to a number of factors: (1) The quantity of extravasated material is usually small, especially when compared with the large quantities which generally escape into the peritoneal cavity on perforation of the stomach or duodenum. (2) The extravasated appendicular contents are usually solid or semi-solid in consistency, whereas the contents of the stomach and small intestine are almost invariably fluid. (3) Generally the material is of a less irritating character. (4) The appendix is often, from its position, so situated that diffusion is rendered slower and more difficult. This will be made quite evident by a reference to Figs. 8, 9, 11, 12, 13, and 14. (5) The movements of the appendix being generally limited will not have the same tendency to diffuse the extravasated material as would be the case with the stomach or intestines.

The previous formation of barricades of fibrous adhesions by a former plastic peritonitis in the neigbourhood of the vermiform appendix will also greatly tend to localise the condition. It must also be admitted that perforation occurring during a first attack of appendicitis may occasionally set up so slowly-spreading a peritonitis that protective inflammatory adhesions may successfully prevent a general diffusion. If but little extravasation occurs from the perforated appendix there is but little tendency for it to be distributed extensively, for the appendix in its involved condition will have little or no peristaltic movements, which might otherwise have tended to distribute the septic fæcal contents far over the peritoneum. In these cases we get

what Mikulicz has described as a *progressive fibro-purulent peritonitis.*

An agglutination between the layers of the peritoneum, thereby limiting the inflammatory condition to a circumscribed area, seems to have occurred in the case of the child Hannah B., recorded below.

These forms of localised peritonitis, or "peri-typhlitic abscess" as they have hitherto been generally termed, are of the greatest importance, particularly to the surgeon, for as Bridge[1] well points out, "The abscess, wherever it is, and however well it may appear to be surrounded by protecting plastic deposits, is a constant menace to life, as evidenced abundantly by a spontaneous opening into the abdominal cavity, the venous canals, the bladder and chest cavity, as well as externally, and into the intestinal canal."

In far the majority of cases these so-called "peri-typhlitic abscesses" owe their origin to an appendicitis, as has been conclusively shown by numerous careful observers.

Fenwick[2] has collected a series of 129 cases of perforative appendicitis that have been published by different authors. In 95 only were sufficient details recorded to afford sufficient data for statistical purposes. Of these 95 a localised collection of pus occurred in 38.

The following case is a fairly typical example of a localised suppurative peritonitis, consequent on perforation occurring in a case of acute appendicitis:—

Case III.—Acute appendicitis: Perforation: Localised intra-peritoneal abscess: Incision and drainage: Death.—Hannah B., aged 7, was admitted to the Manchester Royal Infirmary on February 6th, 1891, under the care of Mr. Jones, presenting symptoms of acute peritonitis.

Clinical History.—The child had always enjoyed good health. On February 2nd, four days before admission, after being at stool, she experienced considerable pain in the abdomen. This persisted, and was associated with absolute constipation.

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[1] Bridge. *Trans. American Physicians*, 1890, p. 31.

[2] Fenwick. "Clinical Lectures on Some Obscure Diseases of the Abdomen," p. 5, 1889.

On admission, distinct dulness was detected in the right iliac fossa. The same day an exploratory incision was made, pus found and liberated, but patient died the following day.

Autopsy.[1]—On opening the abdominal cavity I found the great omentum adherent to the coils of the intestine and covered with flakes of puriform lymph, but there was no free collection of fluid in the peritoneal cavity. There were extensive adhesions about the right iliac fossa, forming a distinct though recently-formed intra-peritoneal abscess, within which lay the vermiform appendix coiled on itself and much matted together. A well-marked double perforation existed near its tip. Small fæcal concretions were found lying loose in the abscess cavity. One of these concretions was just like a cherry-stone, and was only proved not to be such by making a section through it, when it was seen to consist merely of hardened fæcal matter. The remainder of the abdominal organs were healthy. The abscess cavity was closed off from the general peritoneal cavity. The lower portion of the ascending colon and cæcum were covered with purulent lymph, and firmly adherent to the omentum and small intestine. Permission was only obtained for an examination of the abdomen.

The next case forms a complete contrast to the above in nearly all its clinical features, and yet pathologically they are closely allied, although differing considerably in the intensity of the primary appendicitis:—

Case—Chronic Appendicitis: Perforation: Formation of Extensive Intra-peritoneal Abscess: Secondary Acute Peritonitis: Intestinal Obstruction: Death: Necropsy.—Mary G——, a married woman, aged 54, was admitted to the Brackenbury Ward of the Manchester Royal Infirmary on August 2, 1892, under the care of Dr. Dreschfeld.

Clinical History.[2]—For the last ten months patient had been troubled by attacks of vomiting which occurred almost every day. No cause for such could be suggested by the patient herself, and no history of any acute illness could be obtained. During the last three months the vomiting had been so much worse as to be considered "continuous." She had lost weight very rapidly. About two months ago she first noticed that the abdomen was distinctly enlarged. On admission the

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[1] *Manchester Royal Infirmary Post-mortem Reports*—Surgical. Vol. 1887, p. 515.

[2] I am indebted to Mr. J. R. Buckley. House Physician, for notes from which the above clinical abstract has been prepared.

patient was in an extremely weak, almost collapsed, condition. Vomiting occurred frequently. The abdomen was distended, and, in the greater part of its extent dull on percussion. The distension, however, appeared more marked on the right side, and there was very distinct resistance below the region of the liver. Both flanks were dull on percussion. Somewhat vague abdominal pain was complained of, but was mainly situated in the right hypochondrium and epigastric region. The temperature was not raised. In spite of all treatment the vomiting persisted and the patient sank and died on the evening of August 5, three days after admission.

Autopsy :—On the morning of August 6, about eighteen hours after death, I conducted a post-mortem examination of the case. The following is an abstract of my report[1]—

External.—Body that of a much-wasted, middle-aged female. Abdomen protuberant, evidently from fluid distention. Linæ albicantes over lower part of abdominal wall and outer portion of thighs. Slight œdema of the lower extremities. Thickening around finger-joints, with well-marked Heberden's nodosities.

Internal.—Thorax : Pleuræ, slight adhesions, particularly at right base. Lungs : Both intensely congested ; no evidence of tuberculosis. Heart : Soft and flabby, but otherwise presenting no gross lesions. Abdomen—Peritoneum : On opening into the abdominal cavity, several quarts of a yellowish, milky, foul-smelling pruriform fluid escaped from a large intra-peritoneal chronic abscess. This abscess cavity occupied the greater portion of the abdomen. The stomach and the coils of intestines were pushed well over to the left of the median line, and the latter were slightly adherent to each other by the fibrinous exudation of a recent acute peritonitis. The abscess cavity occupied the whole of the right iliac fossa, the right flank, and extended upwards over the right lobe of the liver, forming, as it were, in this part, a sub-phrenic abscess. This was limited on the left by the falciform ligament. Along the under surface of the liver the pus had burrowed as far as to the under surface of the left hepatic lobe, and a small quantity had even extended as far as to the tulum of the spleen. The abscess cavity also reached, as above indicated, to the left of the median line, and in front came quite up to the anterior abdominal wall. It also extended downwards into the pelvis and also involved almost the whole of the left iliac fossa. The

[1] *Manchester Royal Infirmary Post-mortem Reports*—Medical. Vol. 1891, p. 680, No. 207.

size and extent of the abscess cavity is thus seen to be very considerable. The cæcum and appendix, coated with puriform lymph and surrounded by much inflammatory matting, is fixed down to the posterior wall of the right iliac fossa. The appendix, very much thickened, presented a well-marked perforation. It was short, and from its opening into the cæcum extended for a distance of 2 cm., when it opened directly into the abscess cavity. A large probe could be readily passed from the cæcum along the lumen of the appendix, through the perforation, and so into the intra-peritoneal abscess cavity. The extremity of the appendix, 1cm. in length, was fixed to the cæcum by old firm, tough, inflammatory adhesions, and was quite separate from the proximal portion, an interval of nearly 1cm. intervening, where nothing of the appendix remained save a few shreds of soft, semi-gangrenous tissue. The opening of the

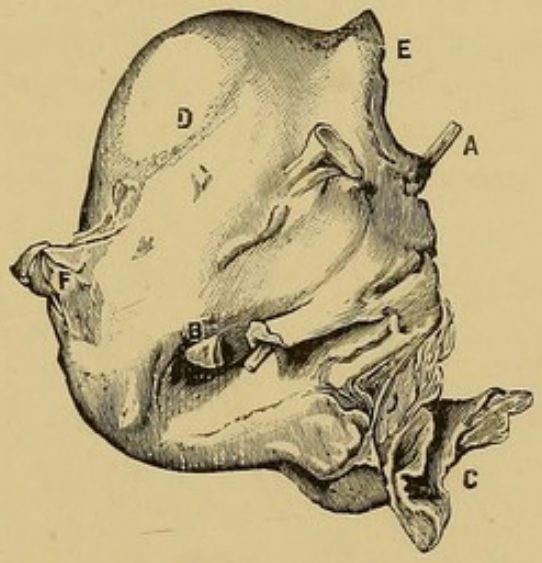

Fig. 20.—Showing the appearance and situation of the perforated appendix, from the case of Mary G———. A.—Probe passing in at appendico cæcal orifice from cæcum along the proximal portion of the vermiform appendix. B.—Adherent terminal portion of the appendix. C.—Cut and shrunken end of the ileum. D.—Anterior surface of the cæcum. E.—Cut end of the cæcum as it passes up to continue as the ascending colon. F.—Old inflammatory adhesions.

appendix into the cæcum was very distinct, being as large as a moderate sized pea, but no concretions or masses of hardened faces were detected, either within or around the appendix. [1] The accompanying illustration shows the appearance and position of the thickened and perforated appendix. The cæcum internally appeared fairly normal. Stomach: Intensely congested; numerous small punctiform hæmorrhages in walls.

[1] The above woodcut is from a drawing kindly made for me by Mr. Windsor, House Surgeon to the Infirmary, from the specimen after it had been hardened, and so somewhat shrunken in spirit. The preparation is preserved in the Pathological Collection of The Owens College, No. 1567.

Small intestines: Much congested; serous coats presented slight flakes of recent lymph, gluing coils to one another. Liver: Weight, 40ozs.; congested; the whole of the upper surface of the right lobe is thickened and covered with thick flakes of curdy pus, forming, in fact, the lower part of the sub-phrenic portion of the general intra-peritoneal abscess. On section the organ appeared considerably softer than normal, and presented commencing post-mortem decomposition changes. Spleen: Weight, 1¾ozs., small, soft, and pulpy. Pancreas: Intensely congested and presented a few hæmorrhages. Kidneys: Weight, 2½ozs. each; both intensely congested; exceedingly soft, the capsule peeled off readily, and there was no distinct naked-eye evidence of either granular parenchymatous or amyloid change. Bladder: Pressed downwards into the pelvis; the upper external surface was covered with thick purulent lymph; internally the walls are congested. Uterus and ovaries: Pressed downwards into pelvic cavity and coated with old inflammatory products.

CHAPTER XVII.

PERFORATIVE APPENDICITIS WITH EXTRA-PERITONEAL SUPPURATION.

PERFORATIVE appendicitis, as we have already shown, leads in most cases either to the production of a general peritonitis or to the formation of an intra-peritoneal abscess. But in some few cases it must be admitted that an extra-peritoneal abscess may be produced. Many observers, particularly a large number of American surgeons, seem unwilling to admit even the possibility of such an occurrence. Sands,[1] on the other hand, contends that, as a rule, all "perityphlitic abscesses" are extra-peritoneal. But when suppuration is met with behind the cæcum, or in the peri-cæcal tissue, forming a so-called "para-typhlitis," there can be little doubt but that in many instances it is due to an inflamed appendix. Fitz goes so far as to believe that, "if the encysted peritoneal abscess, or the abscess in fibrous tissue behind the cæcum, does communicate with the latter, such an opening is usually the result, not the cause, of this abscess."

Ferguson, in an examination of the appendix in 200 bodies, notes that it was in 77 instances so situated behind the cæcum that a perforation of it would have opened into the extra-peritoneal cellular tissue. Such a proportion seems very high; and although I have frequently met with the appendix lying behind the cæcum (Figs. 13 and 14), it has in practically every case been so situated that perforation would, I am inclined to think, have occurred intra-peritoneally.

In the following case, although the sequence of pathological events is hardly so clear as one could wish, I think we have a

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[1] SANDS. *New York Medical Journal*, February 25, 1888, p. 201.

very probable example of an appendicitis leading to extra-peritoneal perforation. I am indebted to Dr. Graham Steell for the interesting clinical history.

Case.—Mary Jane R—, aged 38, a married woman. She had been under Dr. Steell's care in the Infirmary for heart disease, from July 21st to September 6th, 1890, and had been discharged considerably improved. While in hospital a large, congested liver and some ascites were the only abnormal conditions noticed in the abdomen. She had, it is true, an attack of bilious vomiting, accompanied by epigastric pain, but nothing more than what is common in the course of heart disease, and is usually attributed to congestion and catarrh of the stomach. The day after she was discharged she began to suffer from severe pain down the right side of the abdomen, especially at the right iliac fossa. The pain extended down the right thigh, almost to the knee, and movement of the limb greatly increased the pain. The painful part of the abdomen was also tender on pressure. She vomited several times. She also noticed that coughing, and even the taking of a deep breath, increased the pain. The bowels were stated to be regular. She was in "a burning fever," to use her own expression. Later she had profuse perspirations. On admission a swelling was felt, extending upwards, from the outer half of Poupart's ligament and the crest of the ilium nearly to the liver. It did not, however, reach into the lumbar region behind. The tumour was dull on percussion as far as could be ascertained, but it was so exquisitely tender as to interfere with percussion. There was no redness over the surface of the tumour. There was localized œdema, however, after a time. On the 20th, the patient had severe hæmorrhage from the bowels, and gradually sank, dying on the 27th September.

Autopsy.—My friend, Dr. Wild, made the post-mortem examination, and to him I am indebted for full details of the autopsy. The following is an abstract of the report:—[1]

Body moderately well nourished. Anus presented a number of congested and swollen piles. No effusion into peritoneal cavity. The right iliac fossa presented a swelling in the cellular tissue behind the cæcum. On opening this, purulent matter escaped. The cæcum was removed, and the cavity of the abscess was found to be of the size of a small orange, and to extend along the superficial aspect of the psoas

[1] *Manchester Royal Infirmary Post-mortem Reports*—Medical. Vol. 1889, p. 484, No. 240.

muscle. Anteriorly, it was bounded by the wall of the cæcum, having the vermiform appendix at its right lateral aspect, the latter being closely adherent to the cæcum. The walls of the cavity were green-grey in colour, with irregular and sloughy surface. On opening the cæcum the mucous membrane presented an abnormal appearance. The appendix was congested, and half an inch from its commencement an aperture, one-third of an inch in diameter, opened into the abscess cavity.

The heart presented well-marked mitral stenosis.

While acting as House Physician to Dr. Dreschfeld I had opportunities of carefully watching a case where the primary condition seems very probably to have been a suppurative appendicitis, with subsequent extra-peritoneal cellulitis. Whether the case really belongs to this class or not, it is of sufficient interest to at least warrant brief record.

Case.—Mary Ann S—, æt. 23, was admitted to the Brackenbury ward of the Manchester Royal Infirmary on December 17, 1889, under the care of Dr. Dreschfeld.

Clinical History.—Two months ago severe pain was experienced in the right iliac region. It came on suddenly, just after she had risen from bed. The pain soon getting easier, she was able to go about her duties as a servant. The pain, however, shortly returned, and prevented her walking about, but she was only in bed one day. She has gradually got worse. Sometimes the pain seems to shoot upwards, from the heel to the hip-joint. She has tried "Sequah's" remedies, but although the "oil" has been rubbed in for an hour at a time, it has only made her worse. Three years previously she was in bed for six weeks with inflammation of the bowels, during which time she says she was unconscious for 15 days.

On admission the patient was seen to be a fairly-well nourished but sallow-looking girl, with dark rings about the eyes, and an aspect as of long-standing pain. The right leg was kept in a flexed position, and on attempting to extend it there was much pain. It had been kept partially flexed for the last two months. There was great tenderness about the hip-joint, and pain in the right iliac region, increased by pressure or any movement of the limb; but no very distinct dulness or intumescence could be felt in the right iliac fossa. The bowels were constipated. Menstruation had been regular until the present illness. A few

days later slight dulness and a feeling of hardness was detected in the right iliac fossa. On the third day after admission the morning temperature was 100° F. and at night 102° F. She gradually got worse. The temperature continued very irregular. The pain in the right iliac fossa was intense, and the dulness became much more distinct. There was frequent vomiting and diarrhœa. Rapid loss of flesh followed, and severe night-sweats occurred. A small quantity of albumen made its appearance in the urine. The patient was, therefore, transferred to the surgical wards on February 9th, 1890, and on the 17th Mr. Walter Whitehead operated, and liberated a quantity of pus. During the following week the patient was distinctly relieved, and the temperature remained normal. It then again became irregular, and, after lingering for a time, death occurred on March 6th.

Autopsy, March 7.[1]—At the post-mortem examination the cæcum was found much reduced in size, and its wall considerably thickened, and yet very soft. Its cavity was practically obliterated. The small intestine, for 4in. above the cæcum, was also much thickened and dilated. The appendix curved outwards, backwards, and upwards for 3in. Its wall was square, and, 1½in. from its extremity, was gangrenous. It contained hard fæces. Behind the cæcum and appendix was an extensive chronic abscess cavity, not connected, apparently, with the general peritoneal cavity. The lungs presented caseous nodules.

In our post-mortem records there are two cases indexed as "typhlitis" and "perityphlitis" respectively, to which brief reference may here be made. In both there was undoubtedly considerable involvement of extra-peritoneal tissue, but whether this was secondary to an appendicitis it is impossible to say.

Case.[2]—John W—, aged 40. At the autopsy the intestines in the lower part of the abdomen were found coated with lymph, and in many places adherent together as the result of a recent peritonitis. The cæcum was inflamed and thickened, and, at a point where the cæcum was not covered by the peritoneum, perforation had occurred, and the contents of the gut had escaped into the loose peri-cæcal cellular tissue. No mention is made as to the condition of the appendix.

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[1] *Manchester Royal Infirmary Post-mortem Reports*—Surgical. Vol. 1887, p. 376, No. 183.

[2] *Manchester Royal Infirmary Post-mortem Reports*—Medical. Vol. 1867, p. 124, No. 88.

Case.[1]—George B——, a coachman, aged 41. The termination of the ileum and commencement of the large intestine were fixed to the abdominal wall. The surrounding tissue was dense and much increased in quantity, and the gut was fixed down to the sheath of the psoas. On opening into the sheath of the psoas an abscess was found, which extended upwards as far as to the body of the third lumbar vertebra, and downwards to about two inches below Poupart's ligament, where it had pointed and had been opened.

On removing the bowel and the sheath of the psoas attached to it no communication between it and the abscess could be found, though pus was found in the intestine and parts of it were gangrenous. There was no appendix cæci vermiformis, and the ileo-cæcal valve and caput coli appeared to be entirely obliterated. There was no caries of the vertebræ.

[1] *Manchester Royal Infirmary Post-mortem Reports*--Medical. Vol. 1867, p. 150, No. 108.

CHAPTER XVIII.

RECURRENT APPENDICITIS.

RECURRENT or relapsing appendicitis is such a well ascertained pathological variety, and so clearly recognised clinically, that it demands separate description. As its name indicates, it is characterised by the occurrence of distinct attacks, separated by well-defined intervals.

Our knowledge of the morbid condition of the appendix in these cases is somewhat limited, and depends almost entirely on the evidence obtained during the course of operative measures.

The appendix is usually thickened and considerably dilated. It is often distended with mucus. Frequently it is flexed or somewhat twisted. In some instances, instead of being enlarged or distended, it is contracted and puckered, with its walls so much thickened that its lumen may be nearly obliterated. In a few instances small foci of pus have been found in close proximity to the appendicular walls. Often there are extensive peritoneal adhesions firmly fixing down and, as it were, encasing the diseased appendix.

The Attack is, clinically speaking, practically identical with the symptoms already described as occurring in those forms of appendicitis unassociated with extensive peritonitis. Thus there may be characteristic pain and swelling in the right iliac fossa, abdominal distension, intestinal paresis, with consequent constipation, and even sometimes vomiting. Of course, the symptoms will vary considerably according to the severity of the attack.

The occurrence of these attacks has been thought to be due to an intermittent distension of the appendix by its secreted mucus. Others have thought it might arise from the temporary obstruction caused by a small fæcal concretion. Most probably it is the direct evidence of a fresh inflammatory out-

break in the appendicular walls, or in the adjacent peri-appendicular peritoneal adhesions. The attack lasts for several days, usually about a week, but may continue much longer. As many as fourteen attacks have been observed in one patient. McBurney has met with a case where twelve attacks occurred within a year.

The Interval.—During the period between the attacks little discomfort may be experienced. After the first three or four attacks the patient, as a rule, experiences more or less constantly vague abdominal discomfort, with various intestinal disturbances. Aching pain in the right iliac region becomes frequent on even slight exertion, and palpation of this part usually elicits some localised pain.

Recurrent appendicitis does not appear to be very common. Fitz, in his examination of 257 cases of appendicitis, obtained a distinct history of recurrence in only 28. This would give a rate of 11 per cent. Krafft, in 106 cases, found recurrence in 24, or in 22 per cent.

It is exceedingly important to remember that recurrent appendicitis does not show any very great tendency to perforate. Indeed, perforation may be said to be the exception rather than the rule.

CHAPTER XIX.

TUBERCULAR APPENDICITIS.

CONSIDERING the well-recognised tendency for tubercle bacilli to invade lymphoid tissue, it is strange that a structure so rich in such elements as the vermiform appendix, should have almost entirely escaped examination in cases of tuberculosis. And yet it is a fact that comparatively but little attention has been drawn to the by no means rare occurrence of tubercular infiltration and ulceration of its walls.

Even in cases of well-marked pulmonary or intestinal tuberculosis, I believe the appendix is but rarely opened and submitted to a careful examination.

In looking through the numerous examples of tubercular cases recorded in our post-mortem records of the Manchester Infirmary, although detailed descriptions are generally given of the extent and character of the intestinal lesions, I can find no distinct reference prior to 1890 of any involvement of the vermiform appendix itself.

It would appear, however, that the occurrence of a tubercular appendicitis has not been entirely overlooked.

The late Dr. Walsh,[1] in his classic work on "Diseases of the Lungs," clearly pointed out that tuberculous ulceration of the appendix may be met with in cases of phthisis, and goes so far as to say that "ulcerative perforation occasionally occurs more frequently in the appendix than in the cæcum itself."

Habershon[2] also states that "in phthisis it is very common to find ulceration in the appendix cæci, from the degeneration of tubercle." He moreover adds that "sometimes several small ulcers are present, at other times the appendix is almost cut in

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[1] WALSH. "Diseases of the Lungs," 4th edition, 1870, p. 434.

[2] HABERSHON. "Diseases of the Abdomen." 4th edition, p. 414.

two. This condition sometimes leads to fatal peritonitis in the earliest stage of phthisis."

Wilks and Moxon[1] also note that ulceration of the appendix may be met with in phthisis.

Ziegler[2] briefly states that "tuberculous ulceration localised in the vermiform appendage may give rise to dangerous lesions."

Bristowe,[3] however, appears to go a little too far when he says: "The appendix especially rarely fails to present more or less ulceration when typhoid or tubercular deposits occur in other parts of the large intestine."

Quite recently, Fenwick and Dodwell[4] have published a most interesting statistical article, based on the records of the post-mortem examination of 2,000 cases of phthisis, occurring at the Brompton Hospital for Consumption. They found that the intestine was the seat of ulceration 500 times out of 883 cases, or in the proportion of 56·6 per cent. The ileo-cæcal region was involved in 85 per cent, while in 9·6 per cent it was the only portion of the intestine which showed any evidence of disease. The duodenum and rectum were never involved unless the other portions of the tract were in an advanced state of ulceration. Ulceration was present in the duodenum in 3·4 per cent; in the jejunum in 28 per cent; in the ascending colon in 51·4 per cent; in the descending colon in 21 per cent; in the sigmoid flexure in 13·5 per cent; and in the rectum in 14·1 per cent. As regards the vermiform appendix, it was expressly stated that it was the only portion showing evidence of ulceration in seventeen instances, but it seems somewhat doubtful if it was of a simple or tuberculous nature.

These authors suggest "that this portion of the bowel, owing to the large quantity of lymphoid tissue in its walls, its abundant blood supply, and the comparative stagnation of its contents, is peculiarly liable to fall a victim to tuberculous infection, and that the subsequent ulceration may

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[1] Wilks and Moxon. "Lectures on Path. Anat.," p. 407.

[2] Ziegler. Eng. Trans., by Macalister. 2nd edition. II., p. 287.

[3] Bristowe. In "Reynolds' System of Medicine," III., p. 121.

[4] Fenwick (W. Soltan) and Dodwell (P.R.), "Perforation of the Intestines in Phthisis."—*Lancet*, July 16 and 23, 1892.

closely simulate in its macroscopic appearances the result of simple catarrh." In two instances, indeed, where the appendix appeared to be the seat of a simple catarrhal process, microscopic examination showed the presence of numerous tubercle bacilli.

Although tubercular ulceration is frequently met with in tubercular cases, it rarely if ever occurs, I believe, as a primary condition. In all the cases that I have observed it was certainly secondary, or at least associated with tubercular affection elsewhere.

As might be expected perforation is distinctly rare. Fitz, in his collection of cases, only records eight where perforation occurred in a tuberculous appendix.

It is also of interest to note that perforation occurs usually much later in life than is the case with the more frequent form of perforative appendicitis.

Thus Fenwick, in his record of cases of perforation, probably due to a tubercular ulcerative appendicitis, found that only one was below 20 years of age; seven were between 20 and 40; and three were above 40.

During the course of my observations I have met with a number of cases of ulceration of the vermiform appendix in cases of tuberculosis. Brief reference may here be made to the following:—

Case.[1]—Sarah Ellen W——, æt. 44.—There was extensive pulmonary and intestinal tuberculosis. Numerous characteristic tubercular ulcers were situated throughout both small and large intestine. One had perforated and set up an acute fibrino-purulent peritonitis. The appendix was $2\frac{1}{4}$ inches in length, and on being opened presented four small more or less circular tubercular ulcers. At the point of junction of the appendix with the cæcum there was a very typical tubercular ulcerated patch.

Case.[2]—Annie F——, æt. 20.—The mucosa of the vermiform appendix presented one or two small firm nodules, evidently tubercular in character.

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[1] *Manchester Royal Infirmary Post-mortem Reports*—Medical. 1891, p. 508, No. 158.

[2] *Manchester Royal Infirmary Post-mortem Reports*—Medical. 1891, No. 139.

Case.—Samson G——, æt. 4.—The cæcum and appendix from this case was kindly sent me by my friend Dr. Lea. It was removed from a child who died from extensive peritoneal tuberculosis. There were no ulcers found in the small intestines. The cæcum and appendix was bound down by adhesions and embedded in a mass of caseous material. On microscopic examination I found the mucosa of the vermiform appendix exceptionally rich in lymphoid elements, but presenting no distinct ulceration. The meso-appendix was, however, much thickened, and had a characteristic tubercular appearance.

In a number of cases where there has been very marked intestinal tubercular ulceration, the vermiform appendix has appeared quite normal.

CHAPTER XX.

TYPHOID APPENDICITIS.

IT has already been shown how rich the appendix is in lymphoid tissue, and since in enteric fever one of the most characteristic lesions consists in an infiltration and necrosis of certain areas of intestinal lymphoid tissue, it might be thought that similar lesions would be met with in the vermiform appendix. Such, however, does not appear to be the case. At least, extensive involvement of the appendix is certainly by no means common, for I can find but comparatively few recorded instances of its perforation in typhoid fever.

Murchison[1] mentions only one such case of appendicular perforation in his classical work on "The Continued Fevers." He,[2] however, has recorded the case of a girl of 13 where the appendix presented four ulcers, in one of which, about three-quarters of an inch from its distal end, two small perforations were observed.

Norman Moore[3] records four instances. In two fatal cases of typhoid occurring at St. Bartholomew's Hospital death was due to perforation of the appendix. In the case of a girl, aged 12, where eight feet of the small intestine were ulcerated, and where the large intestine was free from ulcers, the appendix was found to be turned in the middle, and on slitting it up a small ulcer was found. Dr. Moore also clearly points out that sometimes it has been thought that ulcers in the appendix were formed previously to, or independently of, the specific fever, but he believes that in his four cases the fact that there was extensive general ulceration makes it probable that the ulceration of the vermiform

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[1] MURCHISON. "Treatise on Continued Fevers," 2nd edition, 1873, p. 623.

[2] MURCHISON. *Trans. Path. Soc. Lond.*, XVII., 1866, p. 127.

[3] MOORE (NORMAN). *Trans. Path. Soc. Lond.*, XXXIV., 1883, p. 113.

appendix, occasionally found in typhoid fever, has the same relation to the fever that ulceration of other parts of the large intestine has.

Fitz, among his 257 cases of appendicular perforation, mentions only three as occurring in typhoid fever.

But Morin,[1] out of 64 collected cases, finds no less than 12 examples, or 18·75 per cent.

Heschl[2] also found perforation in eight instances among 56 cases, or in 14·3 per cent.

Fitz,[3] in a recent communication, records that, in 167 collected cases of perforated bowel in enteric fever, he found only five cases where the appendix was stated to be perforated. This gives just under 3 per cent.

Such variation in statistical results of careful observers may probably be due either to an incorrect diagnosis during life or to the condition of the appendix having been neglected at the post-mortem examination.

But perforation of any portion of the intestinal tract in typhoid is by no means common.

Dr. Moore, of Dublin, who has enjoyed exceptional opportunities for the study of such cases, informs me that he considers intestinal perforation in enteric fever of rare occurrence. During the last four years perforation has only been met with in the proportion of 1 in every 162 cases at the Dublin (Cork Street) Fever Hospital. Dr. Moore also very kindly referred me to a case recorded by Mr. McArdle,[4] where perforation of the vermiform appendix occurred during an attack of typhoid fever.

I myself have not met with any case of perforation of the appendix in typhoid, but I have seen distinct ulceration occur in this fever, as in the following case :—

Case.[5] — Lilian M., *æt.* 17. The vermiform appendix presented

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[1] Morin. *Thèse,* Paris, 1869.

[2] Heschl. Schmidt's Jahrb., 1853, LXXX., p. 42.

[3] Fitz. "Intestinal Perforation in Typhoid Fever." *Trans. Assoc. American Physicians,* VI., 1891, p. 209.

[4] McArdle. *Trans. Roy. Acad. Med. Ireland,* 1888, VI., p. 392.

[5] *Manchester Royal Infirmary Post-mortem Reports*—Medical. Vol. 1891, p. 617, No. 188. The case is recorded in *Medical Chron.*, Aug., 1892., p. 329.

near its middle commencing typhoid ulceration. There was also characteristic ulceration at the lower end of the ileum, at the ileo-cæcal valve, and also in the cæcum.

It must be remembered that severe appendicitis not infrequently, in many respects, strongly simulates enteric fever.

Penn[1] has also shown that so-called typho-malarial fevers have many features in common with some forms of appendicitis.

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[1] PENN. *Mississippi Valley Med. Mon.*, 1887, VII., p. 55.

CHAPTER XXI.

ACTINOMYCOTIC APPENDICITIS.

I BELIEVE there is but one case of actinomycosis of the vermiform appendix on record. This unique example was recently reported to the Royal Medical and Chirurgical Society of London by Dr. W. H. Ransome,[1] who has very kindly sent me notes of the case, together with illustrations of his preparations; and as this case is of great interest, I have ventured to append the following abstract:—

Case.—The patient was a man aged fifty. There was no history of important previous illness, except that, in 1886, he experienced for a short time slight uneasiness about the right inguinal region. His present illness commenced on October 12th, 1888, with severe, but somewhat indefinite, abdominal pain. He, however, continued to get about until October 21st, when he was suddenly seized with internal pain in the right iliac fossa.

On examination, about an hour after this acute onset, Dr. Ransome found a firm, uneven, solid mass, tender on pressure, situated in the right cæcal region. Under treatment he gradually improved until November 17th and 18th, when he was able to walk a little in his bedroom without discomfort. The same evening his temperature rose somewhat. The swelling now increased, so that in the course of a few days it involved the whole of the right iliac fossa, and extended upwards to above the crest of the ilium. There was great tenderness on palpation. The temperature varied considerably, sometimes rising to 102·8° F. The pulse ranged from 84 to 90.

On December 5th he was again suddenly seized with severe pain in the right iliac region, which also extended down the right leg. In four hours the whole limb was swollen, tender, and livid, evidently from thrombosis of the right external iliac vein.

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[1] Of Nottingham.

On December 9th an aspirating needle was introduced at a point just internal to the anterior superior spine of right ilium, but no pus was reached.

By January 4th the œdema and turgescence had almost disappeared, and distinct induration could now be felt from a point near to the anterior end of the eleventh rib, down as far as an inch and a-half below Poupart's ligament.

By January 10th the swelling had increased in the right iliac region, and the right loin, buttock, and upper part of the thigh were much swollen.

On February 14th an abscess pointed close to the spot where the aspirating needle had been introduced.

The following day the abscess burst spontaneously, yielding a little brownish, offensive, thick pus.

On the 17th the opening was enlarged, and about 1oz. of dirty, thick, offensive pus, with a distinctly fæcal odour, escaped.

On February 28th an incision was made in the bone, and the abscess cavity freely explored, and free drainage established. Fragments of a soft, fleshy material, which escaped during the operative manipulations, were found to consist of shreds of coagulated fibrin, of necrosed connective tissue and vascular granulation tissue. The fæcal discharge was also found to contain numerous small brown or blackish particles, which proved to be fæcal masses, mostly of deeply-tinged vegetable tissue, and one or two presented an obscurely crystalline fracture, suggestive of a broken concretion.

Following this operative interference, the temperature fell to normal, and remained so, with but slight fluctuations, for nearly a month.

Up to this time there had been little or no interference with the functions of the intestinal canal. The bowels acted well, the stools were normal in character; food was taken fairly well; the urine was also normal.

On March 20th a further quantity of fœtid pus was liberated, but no improvement followed. Repeated attempts failed to reach any more deeply situated collection of pus, but after an exploration on April 13th, it was observed that the discharge contained spherules having an appearance resembling certain minute ova. These were found, on careful examination, to be spherules or colonies of actinomyces.

When the pus was mixed with water, these spherules sank to the bottom of the vessel. To the naked eye they appeared to be about the

size of a very small pin's head, and seemed to have an adhesive, slimy, or gelatinous envelope, with a coloured centre. Their structure was most characteristic when examined by the microscope.

The patient now steadily grew worse, and death resulted on June 21st.

Autopsy.—A post-mortem examination was made 25 hours after death. There was no general peritonitis. The *vermiform appendix* was tortuous, bound down, and almost lost to sight, being covered by adhesions and thickening of the peritoneum. The aperture of entrance from the gut into the appendix was patent. The appendix was in part dilated, and its walls irregular and having several tortuous communications with a very large and extensive abscess cavity, situated behind the cæcum.

The cæcum, when opened, presented no erosion of its mucous membrane, and did not communicate with the abscess cavity.

The liver also contained a large suppurative focus in which colonies of actinomyces were found.

Microscopic examination of the walls of the retro-cæcal abscess, and of the vermiform appendix where it was dilated, eroded, and communicating with the abscess, failed to detect any colonies of the parasite.

In his remarks on the above case, Dr. Ransome expresses his belief that the appendix was the primary seat of infection, and suggests that probably a grain or fragment of corn or grass bearing the parasite lodged within the appendix. Here it would readily develop, and by its growth establish an inflammatory process in its immediate vicinity. Perforation of the inflamed appendix at its posterior part then probably occurred, and its contents so escaped into the retro-cæcal connective tissue, giving rise to the extensive abscess, and leading to the formation of venous thrombosis.

Dr. Littlewood, of Nottingham, has also sent me the notes of a somewhat similar case to the above, which has recently come under his observation. The patient was a youth, 22 years of age. He gave a distinct history of appendicitis, and when seen a large abscess had already pointed. Mixed with the pus were a number of little, white rounded bodies, closely resembling the spherules of actinomycosis. Dr. Littlewood believes there can be no doubt but that the case was one of actinomycotic appendicitis.

I have, however, examined several of these spherules, and while they most strongly resemble those of actinomyces, and microscopically present a distinct mycelial structure, I have failed altogether to convince myself that the parasite was the ray-fungus.

It seems highly probable that just as fungi other than actinomyces have been found in connection with the tonsils and digestive passages, so fungi, which may present strong resemblances to those of actinomycosis, may be occasionally present in that intestinal trap, the vermiform appendix.

CHAPTER XXII.

SEQUELÆ OF APPENDICITIS.

MANY of the more important consequences and complications of appendicitis have already been indicated in the cases previously recorded. It, however, seems desirable to here bring together certain of the more important sequelæ.

Peritonitis.—It is only through its close association with the peritoneum that the inflammatory affections of the vermiform appendix are brought into a position of first importance. Were it not for the frequency of peritoneal involvement, appendicitis would probably be of but little importance clinically and of but slight interest pathologically.

This peritonitis may be acute or chronic in progress, diffuse or localised in extent, and sero-fibrinous or suppurative in character. Sometimes it is of a peculiarly malignant septic type.

The frequency of appendicitis, as compared with other causes, in producing acute peritonitis is well shown in the following analysis[1] of 124 cases, which I have recently made from an examination of the records of 2,855 post-mortem examinations made in the Post-mortem Theatre of the Manchester Royal Infirmary. Of these 124 cases of acute[2] peritonitis, 94 occurred among 597 "surgical" cases, 30 among 2,259 "medical" cases. As regards sex, 84 were males, 40 females. The cases may be thus grouped:—

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[1] *Medical Chronicle*, July, 1892, p. 220.

[2] In these returns, only acute cases have been included. All localised collections of pus of some standing, and all tubercular cases, have been, as far as is known, excluded.

(1) Traumatism[1]		13
(2) After operations—		
Herniotomy[2]	22	
Laparotomy[3]	9	
Gynecological[4]	8	
Colotomy	7	
Excision of cæcum	3	
Gastrotomy	2	
Excision of rectum	1	
Cystotomy	1	
Lithotrity	1	
Nephro-lithotomy	1	
External urethrotomy	1	
	—	56
(3) Associated with—		
Hernia—strangulated	4	
Intestinal obstruction	4	
Disease of liver	4	
Disease of kidney	3	
Hernia—irreducible	2	
Enteritis	2	
Disease of pancreas	1	
„ spleen	1	
„ ovary	1	
„ prostate	1	
Uterine myomata	1	
Suppuration of mesenteric glands[5]	1	
Suppuration in tunica vaginalis	1	
Stricture of colon	1	
Stricture of urethra; extravasation	1	
Septicæmia	1	
	—	29

[1] Including: contusions, 2; penetrating wounds, 2; gunshot wound, with perforation of intestine, 1; rupture of intestine, 6; rupture of bladder, 2.

[2] In 11 of the 22, perforation of the intestine was found.

[3] Laparotomy was performed for: Intestinal obstruction, 2; intestinal growth, 2; appendicitis, stricture of colon, hernia, peritoneal abscess, and fæcal fistula, 1 each.

[4] Operations in connection with uterus, ovaries, and broad ligament.

[5] Probably secondary to enteric fever.

(4) From perforations[1] of—

Appendix[2]	7
Small intestine	7
Duodenum[3]	4
Rectum[4]	3
Stomach	3
Sigmoid	1
Cæcum	1
	— 26

Fistulæ.—The formation of a fistulous communication between the appendix or between a localised peritoneal abscess of appendicular origin and other portions of the alimentary tract, or even through the abdominal parietes, is by no means rare.

In an analysis of a number of cases made by Bull,[5] whilst 28 opened externally, 15 communicated with the cæcum, 2 with the rectum, and 2 with the bladder.

Paulier,[6] however, gives the proportion of external fistulæ as much less. Among 46 cases he only records 4, while in 15 the abscess opened into the cæcum.

One of the earliest recorded cases of external fistula due to appendicular disease was published by a well-known Manchester surgeon, the late Mr. George Southam.[7] It is that of a case which occurred in the Manchester Royal Infirmary, whilst he was officiating as clerk to Dr. (after Sir) J. L. Bardsley.

The case is of such interest that I publish it as originally recorded:—

Case.—May 15, 1835.—Thomas Ryley, aged 22 years, weaver, stated that twelve months previous to his admission he received a severe blow on the lower part of the abdomen, to which he attributed his present affliction. It commenced with pain in the abdomen, at first

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[1] No operation performed in these cases.

[2] The average age was exactly 14; all were males except one, a girl of 7.

[3] All being chronic round ulcers of duodenum, and all in males.

[4] Two were rectal carcinomata.

[5] Bull. *New York Med. Jour.*, 1875.

[6] Paulier. *Thesis*, Paris, 1875.

[7] Southam (G.). "Disease of the cæcum and appendix vermiformis, issuing in a fistulous opening through the abdominal parietes."—*Lancet*, 1839-40, XXXVIII., p. 565.

slight, and not incapacitating him from following his employment during the first six months of its existence. From this period it became more violent, and a tumour gradually developed itself on the right side, immediately above Poupart's ligament.

When admitted, the abdomen was very tender, and an obscure tumour could be felt on the right side of the linea alba, above the groin; it was very firm, and pressure upon it caused pain. His bowels were moved daily, the fæces being generally light-coloured and loose; the swelling continued to extend upwards until the 23rd of July, when it burst at the umbilicus, and a considerable quantity of fæculent matter of a light colour and thin consistence was discharged; this gave immediate relief to the pain which had accompanied its formation. Fæces were discharged almost daily from the umbilicus, as well as from the anus, the quantity varying in proportion to the violence of the diarrhœa which was present.

He died about the middle of September, and on examination the following appearances were detected :—

Autopsy.—The lower portion of the ileum and the cæcum were extensively thickened in consequence of lymph having been thrown out on some previous occasion. A sinus was formed, extending from the cæcum to the umbilicus; it was formed by the appendix vermiformis cæci, which was bent upwards and adherent to the anterior parietes of the abdomen, to within about an inch of the umbilicus, with which it communicated by a short fistulous canal. The appendix was thickened and dilated, and the shell of a hazel nut was impacted in its middle portion.

Pooley[1] has met with an instance where the entire appendix was thrown off as a slough through the external wound.

A remarkable instance of external fistula of a herniated appendix is recorded by Spanton.[2]

The patient was an unmarried lady, aged 62. There were two sinuses over the upper part of the right thigh, discharging dirty-looking pus in small quantity. During operative interference the vermiform appendix was discovered. The author states—"The appendix had come down behind the peritoneum; the peritoneal cavity was intact, and there was, of course, no

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[1] Pooley. *New York Medical Record*, 1875, X., p. 267.

[2] Spanton. *British Medical Journal*, January 19, 1889, p. 126.

peritoneal covering to the appendix. It was, in fact, a retro-peritoneal hernia of the appendix only through the crural ring." The tip of the appendix was glued to the glands at the crural opening, and by an escape of fæcal fluid had set up suppuration, which had lasted some months.

Communication between the appendix or between a "peri-typhlitic" abscess and the small intestine is very exceptional. Firket[1] records a case where such communication existed between the appendix and the ileum.

As regards appendicular fistulæ in connection with the large intestine, the cæcum is naturally the portion usually involved.

I have recently had the opportunity of examining a remarkable case of multiple appendico-cæcal fistulæ.[2]

Case.—The patient was a young girl. For some time she had suffered from constant fæcal discharge through several fistulæ situated in the right iliac region. To relieve this condition the operation of ileo-colic implantation was performed, according to Senn's method, by Mr. Wright, but death occurred some thirty-six hours later.

Autopsy.—At the post-mortem examination I found the following condition. The vermiform appendix[3] was much thickened and surrounded by matted tissue and firmly adherent to the outer and posterior walls of the cæcum. On laying open the cæcum the aperture leading into the appendix was large and the mucous membrane projected in polypoid masses. On slitting up the appendix it was found to have very thick tough fibrous walls, with its mucous coat much hypertrophied and to a large extent polypoidal. The end of the appendix opened by a fistulous channel into the ascending colon above a slight stricture of its walls. The appendix also presented four fistulous communications with the cæcum.

The cæcum was much thickened and the point where it became the ascending colon was much narrowed by a firm fibrous stricture apparently the result of old inflammatory mischief.

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[1] Firket. *Ann. de la Soc. Méd.-Chir. de Liége*, 1882, XXI., 58.

[2] *Manchester Royal Infirmary Post-mortem Reports*—Surgical. Vol. 1892, p. 103, No. 35.

[3] The specimen is preserved in the Pathological Collection of the Manchester Royal Infirmary, No. W 37.

Coats[1] has recorded several cases where a "peri-typhlitic" abscess communicated with the cæcum.

Merling[2] records a case where the appendix communicated with the cavity of the large intestine.

Jeremiah McCarthy[3] records an instance of communication between the vermiform appendix and the rectum, which was found in a woman dying in the London Hospital of broncho-pneumonic phthisis. The appendix was firmly adherent to the back of the first part of the rectum, the mucous membrane of which, opposite to the adhesion, was perforated by two small holes, which opened into a cavity in the submucous tissue about the size of a small bean. The appendix projected into this cavity in a nipple-like manner, and a small probe could be passed through the appendix into the rectum. Although both the ileum and cæcum presented tubercular ulceration there appeared to be none in the appendix.

In a case, met with in the Post-Mortem Theatre of the Manchester Infirmary, where a large localised intra-peritoneal abscess had formed, as the result of sloughing of a left inguinal hernia, the cæcum and appendix were closely adherent to its right wall and the tip of the appendix had sloughed off into the cavity.[4]

Bailou mentions a case where the sloughed appendix was discharged per rectum.

"Peri-typhlitic" abscesses have also been said to open into the bladder.

In the female an appendicular abscess may discharge into the vagina.

Hæmorrhage.—As far as I know no definite case of death due to internal hæmorrhage resulting from appendicular ulceration into one of the large vessels, has as yet been recorded.

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[1] Coats. *Glasgow Medical Journal*, XI., 1879, p. 319.

[2] Merling. "Observations pour servir à l'histoire des lésions de l'appendic vermiculaire du cœcum."—*Archiv. gén. de Méd.*, 1841, p. 40. (Quoted by Malespine.)

[3] McCarthy.—*Trans. Path. Soc. London*, XXVII., 1876, p. 161.

[4] *Manchester Royal Infirmary Post-mortem Reports*—Surgical. Vol. 1887, p. 233, No. 113.

In several instances, however, the vermiform appendix has been found adherent to the walls of large vessels, or even communicating with them.

Bull, in his list of cases, mentions two, where an abscess of appendicular origin opened into the internal iliac artery.

Powell[1] also mentions a case where the appendix was adherent to the internal iliac artery.

Pylephlebitis. — Mesenteric thrombo-phlebitis is a very important and most fatal complication of appendicitis, especially when associated with extensive peritoneal suppuration.

Fitz, in his collection of 257 cases of perforating appendicitis, found pylephlebitis in 11.

J. F. Payne[2] describes a case in which the appendix was ulcerated at its blind end and the superior mesenteric vein only was thrombosed and prolonged upwards into the portal vein.

Suppurative Hepatitis.—Suppurative hepatitis usually occurs in association with thrombo-phlebitis of some portion of the portal vein. This was so in Dr. Payne's cases above referred to.

Thierfelder[3] points out that suppurative hepatitis is more apt to occur in those cases of ulcerative appendicitis, where perforation has led to the formation of an encysted deposit of sanious pus.

Cases have been recorded by Buhl,[4] Tueugel, Traube, Westermann,[5] Malmsten, Key,[6] and Riedel.[7]

Usually in these cases the thrombosis extends from the mesenteric veins in the cæcal region upwards along the portal vein into its intra-hepatic branches.

A most interesting case of pyæmic abscess of the liver following appendicitis occurred some time since at the Children's

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[1] Powell. *New Orleans Medical and Surgical Journal*, 1855, XI., 468.

[2] Payne (J. F.). "Two cases of suppuration in the liver, consequent on irritation in the appendix vermiformis cæci."—*Trans. Path. Soc. Lond.*, XXI., 1870, p. 231.

[3] Thierfelder. *Ziemssen's Cyclopædia of the Practice of Medicine*, IX., p. 95.

[4] Buhl. *Zitsechrift für ration. Med.*, 1854, S. 348.

[5] Westermann. De Hepatit. Suppur., *Diss. Berdl.*, 1867.

[6] Key. *Nord. Med. Arkiv.*, I, 2, S. 20; *Schmidt's Jahrb.*, Bd. CXLIX., S. 171.

[7] Riedel. "Ein Fall von Pyophlebitis in Folge von Perfor. de Proc. Vermif." Berlin, 1873.

Hospital, Pendlebury, and was recorded by Dr. Ashby.[1] In this instance the ulceration of the vermiform appendix resulted from the impaction of a pin. The pin was encrusted with phosphates and its point had passed through the walls of the appendix into the peritoneal cavity.

Robinson[2] also records an instance of pyæmic abscesses of the liver occurring in a soldier of 19, apparently as the result of ulcerative appendicitis.

Peri-nephritic and Sub-diaphragmatic Abscesses.—Occasionally, as the result of appendicitis, usually with extensive intra-peritoneal suppuration, peri-nephritic or subphrenic abscesses may be formed. These are of the greatest moment, for, in several instances, perforation throughout the diaphragm has followed, setting up a purulent pleurisy and most fatal form of suppurative pneumonia. Thacher[3] has quite recently recorded a most interesting case of this kind.

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[1] Ashby. *Lancet*, November 1, 1879, p. 649.
[2] Robinson. *Lancet*, February 21, 1885, p. 333.
[3] Thacher. *Medical Record*, April 23, 1892, p. 472.

CHAPTER XXIII.

NEW GROWTHS OF THE VERMIFORM APPENDIX.

IT is a remarkable fact that primary new growths of the appendix are practically unknown. This apparent exemption from neoplastic formation of certain vestigial structures is a point of striking pathological importance. Thus also in connection with the alimentary canal, Meckel's diverticulum, representative of a more or less non-obliteration of the omphalo-mesenteric duct is not so very uncommonly met with. Four cases have been observed at the Manchester Royal Infirmary during the past two years, and yet, as far as I know, like the vermiform appendix, it has never been definitely shown to be the primary seat of a new growth.[1]

Mr. Roger Williams, who has devoted much time to the analytical study of a large number of new growths, sends me a most interesting communication, fully establishing the undoubted rarity of growths of the cæcal appendix. In an examination of the records of 15,481 neoplasms met with at St. Bartholomew's, Middlesex, University College and St. Thomas's Hospitals, Mr. Williams could find no mention of any neoplasm involving the vermiform appendix. The 15,481 neoplasms included 7,878 cancers.

Certainly judging from the post-mortem reports of our Manchester Infirmary, which include an immense number examples of carcinomata, primary cancer of the appendix may be said never to occur.

Leichtenstern,[2] however, in his tabular returns representing the frequency of intestinal cancer mentions three cases of cancer of the appendix; but giving no details it is impossible to ascertain if they were primary.

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[1] KELYNACK. "Cases of Meckel's Diverticulum."—*Jour. of Anat. and Phys.*, July, 1892.

[2] LEICHTENSTERN in *Ziemssen's Cyclop. Med.*, VII., p. 636.

Draper[1] has also recorded a case of so-called colloid cancer of the vermiform appendix occurring in a man of 65. According to the report of the post-mortem examination, the following condition was found :—

"Ileum just above ileo-cæcal valve much distended with liquid fæcal matter. At the valve, upon its upper side, three small foreign bodies, two fragments of bone, and a prune stone were found lying upon the orifice into the cæcum. The valve itself was constricted so as to admit with difficulty the tip of the finger. Mucous membrane of cæcum and lower part of ascending colon was thickened and deeply reddened, but not ulcerated. The upper third or head of the appendix was enlarged and dilated to such a degree that externally it was the size of a large plum. Its cavity deeply injected was thickened on the surface and would admit the little finger. The opening to the intestine from the appendix was also dilated. The thickened wall of this enlargement presented the characteristic appearances of colloid disease. The free end of the appendix beyond the dilated portion was very slightly enlarged and contained inspissated fæcal matter in its canal. The peritoneum and subperitoneal tissues adjacent to the new growth were normal in appearance."

No reference is made to any microscopical examination, and judging from the above account it seems very probable that the ileo-cæcal valve was the seat of a carcinomatous infiltration, the appendix being secondarily involved by extension.

The vermiform appendix is, however, occasionally involved by a sarcomatous infiltration, although, as far as I know, that is never primary. A number of cases have come under my observation, where it was affected as a part of a more generalised sarcomatous affection of the abdomen. One of the most striking was that met with in the case of an adult man.

Case.[2] — James P—, aged 39. Extensive lympho-sarcomatous infiltration of omentum, mesentery, and abdominal glands.

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[1] Draper. *Boston Medical and Surgical Journal*, 1884, CX., p. 131.

[2] *Manchester Royal Infirmary Post-mortem Reports*—Medical. Vol. 1891, p. 732, No. 225. The specimen has been added to the Pathological Museum of The Owens College, No. 1780.

The meso-appendix presented a number of round, hard white nodules, many of which were very distinctly pediculated. Microscopically they were found to have a typically lympho-sarcomatous structure. The general appearance, after the specimen had been hardened in spirit, is fairly well shown in the accompanying figure.

In several other cases where there has been extensive sarcomatous involvement of the peritoneum, I have found the vermiform appendix greatly affected. In one[1] of the cases where careful microscopical examination was made there was

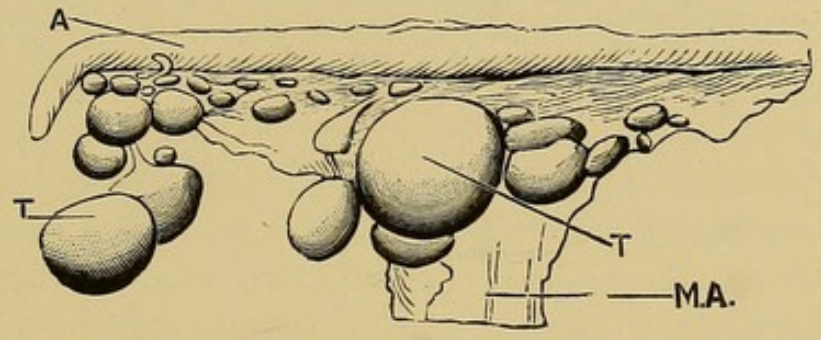

FIG. 21.—Vermiform Appendix with its Mesentery Infiltrated with Lympho-Sarcomatous Nodules. A.—Vermiform appendix. M A.—Meso appendix. T.—Nodules of growth.

extensive peri-appendicular infiltration of sarcomatous round cells, which in many places showed well-marked evidences of degenerative changes. The mucosa was not involved.

References may perhaps be here made to the remarkable case of relapsing appendicitis, recently recorded by Gerster,[2] which so closely simulated a neoplasm in the right iliac region, that the actual condition was only made clear at the operation.

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[1] The specimen is in the Pathological collection of The Owens College, No. 1477.

[2] GERSTER. *New York Med. Jour.*, Aug. 20, 1892, p. 216.

CHAPTER XXIV.

SIGNS AND SYMPTOMS OF APPENDICULAR DISEASE.

SINCE the present volume deals mainly with the pathology of the vermiform appendix, it is not my intention to enter into the symptomatology of appendicular disease at any length. It seems, however, desirable to briefly refer to the more important signs and symptoms of morbid condition of the vermiform appendix. And since such are almost always of an inflammatory character, this chapter will practically be devoted to a consideration of the evidences of appendicitis.

Pain.—In almost every case of well-marked appendicitis pain appears to be one of the first and most striking symptoms. In mild cases, or during the earlier stages of those more acute, there may be little more than slight discomfort. In acute gangrenous appendicitis the pain is often most intense, frequently suddenly increasing to an agony at the time of perforation. In chronic cases, or in those associated with localised intra-peritoneal abscess there is sometimes little or no actual pain complained of. In "recurrent appendicitis" distinct pain is usually only experienced during the attack of appendicular inflammation.

In perforative appendicitis pain is a symptom of the greatest importance. Fenwick found that in 85 cases 63 or 73 per cent complained of abdominal pain as the first symptom. It was of sudden onset in almost every case. In 32 it was referred to the abdomen generally, and in 21 it was located in the right iliac fossa or in the hypochondrium.

The pain is, however, by no means limited to the ileo-cæcal region, and often even when there present may not be more severe than in other parts of the abdomen.

Fitz, in his valuable monograph, has attempted to analyse 213 cases of appendicitis, as regards the chief seat of the pain:—

Chief Seat of Pain.	Number of Cases.	Per Cent.
In right iliac fossa	103	48
„ abdomen	76	36
„ hypogastrium	11	5
„ umbilical region	9	4
„ epigastrium	4	2
„ stomach	3	1
„ hepatic region	3	1
„ left iliac fossa	3	1
„ right hip and groin	1	0·5

The *associated pains* of appendicitis are of the greatest interest. Not uncommonly in perforative appendicitis the seat of greatest intensity may be situated in the left iliac fossa. I have met with one case where the pain was so distinctly referred to this region that laparotomy was performed with the idea that the lesion would be found somewhere in the neighbourhood of the sigmoid flexure.

The testimony of Mr. Godlee is of much interest, as bearing on this point. Mr. Godlee,[1] at a meeting of the Clinical Society of London, stated that his own personal experience enabled him to say that the pain of typhlitis commenced on the right side and passed over to the left, where also it was most acutely felt.

In many instances pain is referred to the right testicle, which is sometimes found retracted.

In one case, already fully recorded, a sensation of priapism was experienced, although no such condition existed. I have met with no reference to a similar instance. Sometimes a frequent desire to micturate is met with.

Dixon[2] records a case of ulcerative perforation in a man of 35, where sharp pain, extending from the abdomen down the cord into the right testicle, was associated with frequent desire to urinate. In some cases the pain extends upwards as far as to the liver. In others it spreads downwards to the rectum and perineum, or even along the thigh.

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[1] Godlee. *British Medical Journal*, December 19, 1885, p. 1161.
[2] Dixon. *Annals of Surgery*, VIII., 1883, p. 23.

Intestinal Disturbances.—In all cases of any severity the disturbances of the digestive organs are among the most prominent of the symptoms.

Constipation of the most obstinate character is almost always present. In the later stages of acute appendicitis persistent vomiting, which usually becomes stercoraceous, is most marked. Occasionally a spurious diarrhœa is met with, and sometimes blood may be passed per rectum.

Even in mild cases of appendicitis distinct evidence of considerable internal disturbance may usually be elicited. A history of tendency to constipation with recurrent "bilious" attacks accompanied by colicky pains is frequently obtained.

Swelling.—As already indicated in the chapters on perforative appendicitis with localised intra-peritoneal, and extra-peritoneal inflammation, a distinct tumour may be met with in the right iliac region. Most usually it is due to inflammatory exudation beneath the adherent coils of intestine. It is but rarely that it is primary in the extra-peritoneal tissue, unless the appendix should be in a retro-cæcal position. Evidence of such circumscribed swelling is of considerable importance, as it indicates that an attempt is being made, by the throwing out of barriers of inflammatory lymph, to limit the inflammatory process. Even before a distinct tumour can be seen, careful palpation may detect a circumscribed resistance, with sometimes a sense of fluctuation. By gentle percussion a certain amount of dulness may often be detected.

In an acute case such a tumour may make its appearance as early as from the third to the fifth day, but generally it is not sufficiently marked to be of much diagnostic value until after the second week of the illness.

Vierordt[1] goes so far as to state that "In inflammation of the vermiform appendix we can seldom affirm that there is a tumour."

Temperature.—In mild cases the temperature may show no rise, and even in acute perforative appendicitis it is but rarely

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[1] Vierordt, "Med. Diagnosis." Trans. by Stuart. 1891, p. 316.

above 103° F., and usually ranges between 100° F. and 102° F.

McBurney[1] has recently published the charts in a number of cases. They most graphically illustrate the character of the temperature in this affection.

Condition of the Urine.—Revilliod[2] believes that the urine may afford important information. If the affection belongs to the territory of the portal vein the urates are said to be greatly increased, while if the affected organs are in the regions tributary to the inferior vena cava, this increase, he states, is not observed.

In perforative appendicitis also the urine is usually slightly albuminous, of high colour, and much diminished in quantity, dependent, no doubt, on the general fall in arterial tension. Indican is sometimes present.

Genital Derangements.—In the female suppression of the catamenia is said not infrequently to occur at the onset of appendicitis. To what extent it may be considered as of distinct reflex origin is hardly clear.

General Symptoms.—The general symptoms have been sufficiently referred to in the record of cases. Most of these symptoms are really due to the involvement of the peritoneum.

Thus, the feeble, broken, or whispering voice; the anxious expression of face with pinched and sunken cheeks; the characteristic decubitus with rigidity of the abdominal walls and prominent veins; the abdominal distension, constipation, persistent vomiting, and tendency to retention of urine; the short thoracic breathing, rapid pulse, and raised temperature; and the general abdominal pain, all point to an acute inflammatory condition of the peritoneum. It is for the physician or surgeon to decide as to the possibility of its appendicular origin.

McBurney's Point.—Among the signs of appendicitis, McBurney[3] has recently drawn attention to a special point

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[1] McBurney. *Medical Record*, New York, April 16, 1892.

[2] Revilliod. *Revue Médicale de la Suisse Romande*, Geneva, Nov., 1891.

[3] McBurney. *New York Medical Journal*, Dec. 21, 1889, p. 678.

of localised tenderness, which he considers as almost pathognomonic of appendicitis.

He writes: "I believe that in every case the seat of greatest pain, *determined by the pressure of one finger*, has been very exactly between an inch and a half and two inches from the anterior spinous process of the ilium in a straight line drawn from that process to the umbilicus. This point indicates the situation of the base of the appendix when it arises from the cæcum, but does not by any means demonstrate, as one might conclude, that the chief point of disease is there."

He also states that "perforation usually occurred within an inch of the point of the attachment of the appendix to the cæcum."

In a still later communication[1] McBurney has again insisted on the importance of this sign. He, however, admits that careful examination must often be made before it can be detected.

"In the first hours of an attack of appendicitis it is not enough to compress with the whole hand the region of the iliac fossa. Such pressure will often elicit no more complaint from the patient than pressure of a similar kind made at other parts of the abdomen. But if firm pressure is made with the finger-tip, and especially if the patient be made to cough while such pressure is being exerted, it is invariably easy to determine that the most sensitive point is a definite one in most cases. This point is very accurately in the adult from $1\frac{1}{2}$ to 2 inches inside of the right anterior superior spinous process of the ilium on a line drawn to the umbilicus. In children it is, in proportion to their size, so much less distant from the spinous process. Occasionally this most sensitive spot will be found a half inch or so nearer the pubes, and sometimes this sensitive area will be larger than usual, but from the first hours of the disease even up to the end of several days, this sign may be clearly made out in every case. No other acute disease presents this feature. The accuracy of this sign I have demonstrated in

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[1] McBurney. *Annals of Surgery*, XIII., 1891, p. 236.

every case operated upon by me since I first made the observation." He also adds that "in late stages of the disease this sign does not usually exist."

While, however, Weir and numerous other American surgeons fully confirm the conclusions of McBurney, many still consider them of but slight value, and Price[1] goes so far as to speak of this point as "ununiform and worthless."

Gibbons[2] thinks a "McBurney point" may be found at any location throughout the body where, with point pressure, muscle structure in septic or inflamed condition is put upon the stretch. He also points out that such localised pain is more easily found at points where tendinous elements enter into the muscle structure, and finally at the complete tendinous structure, characteristic pain is very quickly elicited as soon as the parts are made tense.

Keen[3] records a case where the right iliac fossa was free from tenderness, but where there was slight pain and tenderness all over the right half of the belly, the most painful spot being far away from McBurney's point and just under the border of the liver, and about an inch inside the line of the anterior superior spine. The suppurating appendix had a retro-colic position.

Fowler[4] refers to a case where there was entire absence of both local pain and tenderness, referable to the right iliac region, and where, in consequence, operative interference was delayed, although the entire clinical picture suggested an acute perforative appendicitis. At the post-mortem examination the appendix was found lying to the left of the median line about an inch above the level of the umbilicus, and fixed in this position by an exceedingly short meso-colon.

It has been clearly shown that localised tender spots in the iliac fossa are by no means infrequent in other conditions than appendicitis. Thus in cases of perforation of duodenal ulcers,

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[1] Price. *Buffalo Medical and Surgical Journal*, December, 1891.

[2] Gibbons. *New York Medical Journal*, April 18, 1891, p. 452.

[3] Keen. *Buffalo Medical and Surgical Journal*, December, 1891.

[4] Fowler. *Annals of Surgery*, XIII., 1891, p. 283.

Dr. Dreschfeld has shown that well-marked local pain may sometimes be found to exist in the right iliac fossa.

Hodgman[1] has met with a case—not of appendicitis—where "the left side was also tender at a point corresponding to the McBurney on the right, yet to not nearly the same extent as the latter."

Indeed, as Ransohoff points out, tender spots may be found in the iliac fossa in perfectly healthy individuals.

Whatever may be the value of "McBurney's point" for diagnostic purposes, I am convinced, after an examination of a very large number of cases, that certainly he is wrong in stating that "this point indicates the situation of the base of the appendix."

Exploratory Puncture.—The use of a hypodermic needle for the exploration of doubtful tumours in the right iliac region has been sometimes advised. Such appears to be a most undesirable proceeding, as being most commonly useless and always unscientific.

Rectal Examination.—In some few cases a rectal examination may assist in ascertaining the extent or direction of an appendicular abscess.

Vaginal Examination.—In females, a vaginal examination may prove of the greatest service in assisting to a right diagnosis in some obscure cases.

Senn's method of ascertaining the presence of gastro-intestinal perforation by rectal insufflation of hydrogen gas, is, of course, useless in cases of perforative appendicitis.[2]

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[1] Hodgman. *New York Medical Journal,* November 15, 1890.

[2] Senn. *Journal of the American Medical Association,* June 23 and 30, 1888.

CHAPTER XXV.

DIAGNOSIS OF APPENDICULAR DISEASE.

THE importance of *early* diagnosis of cases of appendicitis is of paramount importance to any successful treatment. In many cases neglect to recognise the true condition of affairs early in its course almost of necessity ensures a fatal termination.

Brief reference will therefore be here made to those affections for which appendicitis has been mistaken.

Simple Excessive Cœcal Distension.—Such a condition is very common. There is usually a distinct history of long-standing constipation. The patient is often in feeble health, advanced in life, and of the female sex. Pain is generally trifling, and there is but little constitutional derangement. A soft doughy mass can be detected in the cæcum, often extending upwards into the lumbar region.

Inflammatory Affections of the Alimentary Canal.—Mild cases of appendicitis are very frequently put down to slight gastro-intestinal affections. The symptoms are frequently so indefinite that they are looked upon as indicating but a slight attack of enteritis, with consequent constipation and colic. When vomiting occurs from time to time the patient is often thought to be suffering from the mere temporary derangement of a "bilious attack." In the more acute affections, until quite recently, the cæcum has been looked upon as the chief seat of the inflammatory process.

The possibility of a primary ulcerative cæcitis, even leading to perforation, must not be entirely neglected, rare though it be.

Perforation of the Intestinal Canal.—In those cases of acute perforative appendicitis where acute diffuse peritonitis exists when the case first comes under observation, accurate diagnosis may be exceedingly difficult. Such a condition may

result from perforation of a chronic gastric or duodenal ulcer; it may occur from typhoid or tubercular ulceration of the intestines; and occasionally, though rarely, occurs in the course of malignant disease of the stomach or intestines. When acute peritonitis comes on in patients already under observation for definite diseases in which such an occurrence is recognised as a possibility there will be but little difficulty in coming to an accurate diagnosis. In all other cases the history and general appearance and condition of the patient has to be carefully considered. It must be remembered that gastric, duodenal, and appendicular perforating ulcer are frequently latent.

Intestinal Obstruction.—Intestinal obstruction, as from intussusception or internal hernia, in many cases strongly resembles certain forms of acute perforative appendicitis. Ransohoff has recorded twelve instances of appendicitis, where the symptoms resembled in every way those of intestinal strangulation.

Hartley[1] mentions two cases where operative interference was undertaken for what was thought to be intestinal strangulation, but which was proved to be gangrenous appendicitis. Peyrot[2] has recorded similar cases.

Henrot in his monograph on "Pseudo-strangulation" also shows that symptoms of intestinal obstruction, due to intestinal paresis, are not infrequently met with in cases of strangulation or perforation of the appendix.

Typhoid.—Some anomalous cases of enteric fever occasionally somewhat closely resemble cases of appendicitis. My friend Dr. Goodfellow recently brought before the Manchester Pathological Society the specimens of intestinal perforating ulcers from a case of typhoid where many of the symptoms were very similar to a case of "peri-typhlitic" abscess.

Such cases can usually be differentiated by careful consideration of the previous history, together with the general

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[1] Hartley. "Appendicitis."—*New York Medical Recorder*, August 16, 1890.

[2] Peyrot. "De l'intervention chirugicale dans l'obstruction intestinale.—Thesis, Paris, 1880.

characters of the case, particular attention being directed to the temperature and to the examination of the abdomen.

Acute Irritant Poisoning.—The onset of perforative appendicitis is occasionally so sudden as to suggest to the patients friends the possibility of poisoning. In several of the cases I have recorded, the first severe symptoms came on shortly after a full or an exceptional meal, which was considered by the friends as probably the cause of the illness.

Cancer in the Ileo-cæcal Region.—A consideration of the history of the case will at once distinguish any carcinomatous tumour in this region from the swelling due to inflammatory products of appendicular disease.

Perforation of the Gall-Bladder.—Cases have been noted by Murchison, Hector Mackenzie and others, which presented symptoms not unlike those met with in certain cases of perforative appendicitis.

Biliary Colic is hardly likely to be mistaken for appendicular colic. The absence of any distinct rise of temperature or involvement of the peritoneum, together with a consideration of the seat and nature of the pain and the frequent occurrence of jaundice, will readily distinguish this affection.

Passage of Renal Calculus.—Occasionally this simulates the pain occurring in acute appendicitis. A medical friend informs me that for some time previous to the passage of a small uric acid calculus he experienced much pain in the right iliac fossa.

Mr. Jordan Lloyd has recently published a case in which he removed a gangrenous vermiform appendix where a calculus in the ureter had been expected, from the fact that the patient had suffered, for some years, from calculous nephralgia of the left kidney.

Movable Kidney.—Osler[1] points out that the attacks, characterised by severe abdominal pain, chills, nausea, vomiting, fever, and collapse, occasionally met with in cases of widely movable kidney, may be thought to be due to attacks of recurrent appendicitis.

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[1] Osler. "Principles and Practice of Medicine," 1892, p. 720.

Nephritic and Perinephritic Disease.—Where inflammation occurs in an appendix having a retro-cæcal position, localised suppuration may occur in the lumbar region and closely simulate a perinephritic abscess.

Affections of the Female Genital Organs.—Ransohoff states that pyosalpinx has been mistaken for perforative appendicitis, and Barker[1] shows that hæmatocele has also be similarly confused. Richelot[2] mentions a case presenting the characteristic symptoms of salpingitis, where on performing laparotomy an appendix was found adherent to the right ovary.

Harrington[3] also records a case where symptoms supposed to be due to an ovarian tumour originated in a displaced appendix.

Disease of the Hip Joint.—Gibney[4] has recorded several instances where the symptoms of appendicitis closely simulated those of hip disease. He believes that "primary peri-typhlitis occurring in children presents many of the signs, especially if it be sub-acute, of hip disease in the first and second stages."

I have met with a case occurring in a young girl, where, before distinct fulness could be detected in the iliac fossa, the case was thought by some to be "hysterical hip-joint disease."

Suppuration in the Muscular or Cellular Tissue of the Iliac Fossa.—This condition is rare, unless secondary to appendicular disease. All the symptoms are of limited extent, and usually associated with the presence of a distinct tumour. Marked gastro-intestinal symptoms are generally absent.

Spinal Caries.—Cases have been recorded where the pain along the course of the last dorsal nerve, due to spinal caries, has been mistaken for appendicitis. Such a mistake could only arise from insufficient examination.

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[1] Barker. *N.Y. Med. Rec.*, 1880, XVIII., 663.

[2] Richelot. *Bull. Soc. Chirurg.*, Oct. 15, 1890.

[3] Harrington. *Bost. Med. and Surg. Jour.*, 1891, CXXV., p. 624.

[4] Gibney. "Perityphlitis in Children."—*American Jour. Med. Sci.*, 1881, LXXX., p. 119.

CHAPTER XXVI.

TREATMENT OF DISEASE OF THE APPENDIX.

FOR all practical purposes the only affections of the vermiform appendix calling for treatment are those of an inflammatory character—the various forms of appendicitis.

It is not within the scope of the present monograph to enter with anything like detail into a consideration of the different measures adopted for the treatment of this affection.

It is necessary, however, to indicate such methods and measures as may be looked upon as the direct outcome of our present pathological knowledge.

Cases of appendicitis are constantly passing into the hands of medical men. The milder forms most frequently come under the observation of the physician, and in a very large number of instances are most satisfactorily relieved by what may be spoken of as simple medicinal measures.

On the other hand, the more severe cases, where evidences of local suppuration or general peritoneal envolvement are marked, naturally come under the care of the surgeon.

Considerable difference of opinion has hence arisen between physicians and surgeons as to the desirability of general medicinal treatment, or surgical interference in given cases.

Since the adoption of surgical measures may be demanded in what even seems to be a mild form of appendicitis, it is most desirable, if we are to live up to our knowledge of pathological facts, that there should be free and early co-operation of physician and surgeon.

Certainly, physicians cannot but most heartily congratulate modern surgery on its brilliant results in saving many otherwise hopeless cases.

Medicinal Treatment.—There cannot be the slightest doubt that a very considerable number of cases recover with the aid of general medicinal measures.

Such measures may be grouped under the following heads:—

Rest.—This is of the first importance, and since it can only be satisfactorily maintained in the recumbent position, it is necessary in all cases to keep the patient absolutely confined to bed.

Diet.—Since local intestinal rest is as necessary as rest to the body as a whole, it is necessary that only the simplest, blandest, and least peristalsis-producing foods should be given.

Local Applications.—The local application of moist heat in the form of poultices or hot fomentations in many cases hastens resolution. Some have advised the use of cold in the form of Leiter's coils.

Others have advised such local administrations as a mixture of iodoform, collodion, tincture of iodine, and tincture of nutgalls, while some believe that sapo viridis hastens absorption. Such measures probably do far more harm than good.

Leeches, Scarification, and Cupping.—There can be no doubt that in some cases considerable relief has followed the local extraction of blood.

Drugs.—The agent most relied on is opium. Useful as it may be when judiciously administered, it must be admitted that it is often unwisely employed. Large dosing with opium, sufficient to mask the symptoms, is to be most strongly condemned. Morphia, in the form of hypodermic injections, may sometimes be necessary to relieve intense pain.

Some have very strongly advocated the use of saline purgatives. Link[1] recommends a full dose of sulphate of magnesium every hour until free watery discharge occurs. Calomel and castor oil are advised by some. Since the actual morbid condition of the vermiform appendix can rarely be ascertained with any degree of certainty, anything like a frequent use of purgatives is to be condemned.

The various intestinal antiseptics which have been recommended are probably of but little service in this class of case.

Surgical Treatment.—In certain forms of appendicitis operative interference is the only measure that can avert a fatal termination.

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[1] Link. *New York Med. Jour.*, Jan. 9, 1892, p. 43.

Speaking from a pathologist's point of view, the varieties of appendicitis calling for surgical interference would appear to be as follows:—

1. All cases of acute perforative appendicitis, with diffuse peritonitis. Here laparotomy is the only measure which offers any chance for the patient. The earlier it is performed the better, for septic peritonitis quickly gives rise to a condition of general sepsis, which is almost necessarily fatal.

2. Cases of perforative appendicitis, with localised abscess. The principles of scientific surgery here also call for operation. As long as there is an encysted abscess cavity there is always the possibility of a sudden irruption into the general peritoneal cavity, which must almost inevitably prove fatal. True surgery anticipates such an event.

Mr. William H. Bennett[1] forcibly puts the advantage of operation, when he says:—"Unless the abscess has already burst into the peritoneal cavity this danger to life can invariably be removed by opening and draining the abscess."

3. In those acute cases, rapidly progressive in character and quickly leading to gangrene of the appendix, the advisability of forestalling the time of perforation is self-evident. The difficulty arises in early diagnosing such condition.

4. In cases of "recurrent" or "relapsing" appendicitis, where the attacks are so severe or so frequent as to seriously interfere with the duties of the patient.

The treatment of recurrent appendicitis by excision of the vermiform appendix was first introduced by Treves,[2] in 1887, but no one is more emphatic in insisting on the importance of the proper selection of such cases. Mr. Treves believes operative interference should be undertaken only between two possible attacks. Dennis on the other hand is opposed to operation during the quiescent period, and suggests the desirability of the surgeon waiting until the commencement of a fresh attack. As a general principle, operation should not, except under the most urgent conditions, be undertaken on inflamed tissues.

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[1] Bennett. *The Clinical Journal*, I., No. 5, Nov. 30, 1892.

[2] Treves. *Medical Chir., Transactions*, LXXI., p. 165.

It must be remembered that under the most favourable circumstances, as Dennis[1] and others have shown, excision of the appendix for recurrent appendicitis is often a most complex and difficult operation. Often there is great difficulty in finding it, and sometimes it may be so surrounded by dense old inflammatory adhesions as to make removal impossible.

Murray[2] gives the mortality of laparotomy for recurrent appendicitis as a little over five per cent.

Particularly in the case of children, operation must be early if it would be "timely."

According to Foxwell[3] the chief reasons are: (1) children are more liable to perforation and abscess; (2) these often occur speedily, and with little or no warning; and (3) children are more likely to be exposed to injury than the adult, and so suffer a traumatic perforation.

Greig Smith[4] also recommends that "almost as soon as appendicitis is definitely diagnosed in children operation should be performed."

The main contra-indications for operation are—general sepsis, old age, unusual obesity, complicating diseases, and unmanageable intestinal distension.

As, however, laparotomy in many cases is the only door of escape from impending death, and since even apparently moribund cases have recovered, it seems undesirable to deprive any possible case of the last chance.

Recently the tendency has been to enforce the importance of early surgical interference in nearly all cases of appendicitis to the almost complete neglect of medical treatment. As bearing on this point I cannot do better than quote the valuable opinion of Mr. Treves[5] on the needs and limits for operation: "I wish to protest," writes Mr. Treves, "against the quiet assumption that all cases of typhlitis, and even those which are distinctly

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[1] Dennis. *Medical News*, June 28, 1890.

[2] Murray. *New York Medical Journal*, May 24, 1890, p. 565.

[3] Foxwell. *Birmingham Medical Review*, July, 1890.

[4] Smith (Greig). *Abdominal Surgery*, 4th Edition, p. 768.

[5] Treves, *Lancet*, Feb. 21, 1891.

acute, demand surgical treatment, and that in the majority of instances at least medical measures avail little. I have shown elsewhere that the majority of examples of what is known as acute typhlitis end in recovery under simple medical treatment, and that a surgical handling of the trouble is only called for in a comparatively few selected cases, and that even in these it is possible to clamour for a too early operation. There are cases of appendicitis and cases of relapsing typhlitis which get well without the surgeon's aid, and I would urge that more discrimination should be exercised in selecting the cases which are suited for operation. The almost reckless and injudicious manner in which, to judge from published and private reports, the appendix is being excised at the present day, is doing a great deal to bring the operation into discredit, and to direct an adverse criticism against what is, in suitable cases, a most valuable and indeed indispensable measure."

Details as to the situation, shape, extent and general characters of the operative incisions, together with all the minutiæ as to technique of the operation, must be left to the skill and experience of the surgeon.

Whatever pathological grouping of appendicitis may be adopted, the all-important practical classification clearly defined in the mind of every physician and surgeon must ever be (1) Operative appendicitis and (2) Non-operative appendicitis. Such a clearly defined division is of paramount importance to the patient, for his life will probably depend upon it.

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