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APPENDICITIS

AND

ITS SURGICAL TREATMENT

WITH A REPORT OF SEVENTY-FIVE
OPERATED CASES

BY

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1897

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PREFACE.

THE author has attempted in this work to sift the evidence and weigh the testimony for and against the operative treatment of appendicitis. While in the United States this disease is considered an almost exclusively surgical lesion, the same is by no means the case in other countries. We find there men of undoubted authority, and whose opinions are entitled to respectful attention, in the ranks of the conservative physicians, who operate only in exceptional cases and advise against surgical interference as a standard treatment. The author has, however, after careful study of a large number of foreign and American authors and of numerous statistics, come to the same conclusions as most other surgeons, that appendicitis is a surgical lesion and ought to be treated by surgical means, and that medicine is unable to prophesy as to the result in a given case or to prevent gangrene and perforation with resulting fatal peritonitis.

The surgical treatment, therefore, must be considered the conservative treatment, the quickly healing and least dangerous method, and it is radical in so far as a relapse is impossible. The medical treatment is a makeshift, uncertain in its results, unable to prevent the often fatal complications, and therefore dangerous.

For most of the older literature I am indebted to the Surgeon-General's library in Washington. It has been my purpose not to overlook any paper of importance, but, nevertheless, only a smaller number of English, French,

German and Scandinavian authors have been consulted. The American literature, I hope, will be found more complete. It is scattered through numerous periodicals, the files of most of which are kept in the library of the University of Buffalo.

The degree of Doctor of Medicine is not conferred in Denmark at graduation as in America. It requires the writing of a monograph showing special studies and individual experience, and is equivalent to *Habilitations Schrift* in Germany, conferring the right to give lectures in the halls of the University as *Private docent*. Desiring to obtain the degree of Doctor of Medicine from his *alma mater*, the University of Copenhagen, twenty-six years after graduation, the author submitted this monograph to the University, and it was accepted in July, 1897.

H. MYNTER.

566 DELAWARE AVENUE,

BUFFALO, N. Y., February, 1897.

CONTENTS.

PART I.

	PAGE
HISTORICAL INTRODUCTION	7
ANATOMY	17
HISTOLOGY	22
FUNCTION	24
ETIOLOGY	25
PATHOLOGY	49
CLASSIFICATION	51
SYMPTOMATOLOGY	75
COMPLICATIONS AND SEQUELS	89
DIAGNOSIS	93
Differential Diagnosis	100
PROGNOSIS	108
TREATMENT	122
Medical Treatment	145
Surgical Treatment	153
STATISTICS	171

PART II.

CASES	175-291
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APPENDICITIS

AND

ITS SURGICAL TREATMENT.

PART I.

HISTORICAL INTRODUCTION.

THE names perityphlitis and typhlitis, which were used exclusively until very recent times to denote inflammatory conditions in the right ileocæcal region supposed to depend upon inflammation of the cæcum and its surroundings, are neither anatomically nor pathologically correct. These inflammations are, in the great majority of cases, dependent upon inflammation of the appendix itself, the cæcum only occasionally being primarily attacked, and the abscess is not retrocæcal or pericæcal except in a minority of cases, but intraperitoneal. The importance of the peritoneum as a pathological factor was known from the beginning of this century, but the name did not indicate it. The name peritonitis appendicularis, introduced by Prof. With, is perhaps the happiest, as being pathologically, anatomically, and clinically correct. The name appendicitis, however, is already of common usage the world over, although in the majority of cases correct only in the earlier stages of the disease; we shall therefore retain it as the now universally accepted name.

Until 1827 sporadic cases of perforation of the appendix, generally dependent upon foreign bodies, had been

noted and published as curiosities. One of the earliest recorded cases is by Mestivier¹ in 1759. The patient was a man forty-five years of age, who entered Saint-Andre Hospital in Bordeaux with a fluctuating swelling in the umbilical region. It was incised and a pint of pus removed. The patient died, and at the autopsy an encrusted needle was found in the appendix as the cause of the abscess.

Jadelot,² in 1808, reported the case of a boy who died on the tenth day of adynamic fever. At the post-mortem numerous ascarides lumbricoides were found in the ileum, four of which were heaped together in the dilated appendix.

Wegeler,³ in 1813, reported the case of a boy, eighteen years of age, with fixed pains in the right iliac region, meteorism, weak pulse, and stercoraceous vomiting. He had been sick three days, and died on the fifth day. The cæcum was found in a state of gangrene, which seemed to have begun at the insertion of the processus vermiformis. The appendix was congested and enlarged, and was found to contain, "non sine summa admiratione," some hard bodies, found to be stones, some small, one as large as the egg of a dove. No mention is made of peritonitis being present. Wegeler had been able to find in the literature only one similar case, in which a needle formed the nucleus of a concrement.

A similar concretion, as large as a hazel-nut and containing a hair in the centre, is reported by Vicq d'Azyr⁴

¹ Journal de Méd., Chir. et Pharm., 1759, p. 441, quoted by Maurin.

² Reported by Mélier, Journal général de Médecine, de Chir. et Pharm., vol. c., 2d Series, No. 39, p. 342.

³ Historia enteritidis malignæ, et singularis calculosi concrementi, Journal de Médecine, Chir. et Pharm., 1813, vol. xxviii. p. 384.

⁴ Bibliothèque médicale, 1814, vol. xliii. p. 386.

in 1814. Bottomley,¹ 1814, mentions the case of a child, seven years of age, who complained suddenly of severe pains in the right side of the abdomen, two inches from the navel, and accompanied with considerable fever. The symptoms and pain continued for seven days, when a swelling appeared in the lumbar region. An incision was made and a pint of pus discharged, which contained a kernel of oats, swallowed four months previously. Lonyer-Villermay,² 1824, reports two cases of acute inflammation of the appendix with gangrene and death on the fourth and third day.

Mélier,³ 1827, is, however, the first to group together several observations and draw conclusions from them. He complains that no inquiries have been made into the diseases of the appendix, and that the authors seem to have paid no attention whatever to this organ, because no influence has been attributed to it in the human economy. Nevertheless, he says, observations gathered together prove that this organ in certain cases may be the seat of quickly fatal diseases, and especially from fecal accumulations in its cavity. He reports eight cases, two of which he had observed himself, and gives a short description of the symptoms and differential diagnosis from feculent accumulations in the cæcum. His paper seems, however, not to have attracted attention.

Ferrall,⁴ four years later, does not mention the appendix at all, but ascribes the phlegmonous tumors to affections

¹ Bibliothèque médicale, 1814, vol. xliv. p. 278.

² Archives générales de Médecine, 1824, p. 246.

³ Mémoire et observations sur quelques maladies de l'Appendice cœcale, Journal général de Méd., Chir. et Pharm., 1827, c., 2d Series, No. 39, p. 317.

⁴ On Phlegmonous Tumors in the Right Iliac Region, Edinburgh Medical and Surgical Journal, July 1, 1831.

of the cæcum. We may have a painful tumor in the right iliac region, dependent (1) upon the presence of hardened fecal matter in the cæcum, (2) upon inflammation of the walls of the cæcum, with coagulated lymph as the nidus of a future abscess, which may perforate into the cæcum, colon, bladder, rectum, vagina, or lumbar region, or (3) upon perforation of the cæcum from within outward, the abscess being secondary, and leading to the formation of an artificial anus or to a general peritonitis. Dupuytren¹ also, in 1833, ascribes these inflammatory tumors to the cæcum. They terminate in a large number of cases in resolution, and in some cases in an abundant suppuration, which may extend over the whole peritoneum. He does not mention the appendix, but gives a clear description of what we now would call appendicitis.

John Burns,² 1837, in an interesting article, states that diseases of the cæcum and appendix have received no consideration in works on practical medicine, although they are of frequent occurrence, always dangerous, often fatal, and characterized by a train of symptoms so peculiar as to render their recognition certain and not difficult. They are apt to be confounded with idiopathic abdominal inflammations, although they in every case depend upon lodgement of fruit-stones and concretions. He gives a clear description of the symptoms, although he believes that they depend more upon the cæcum than upon the appendix. He advises a mild antiphlogistic treatment and to open the abscess when an emphysematous condi-

¹ Des abcès de la fosse iliaque droite, *Leçons orales de Clinique Chirurgicale*, 1833, vol. iii. p. 330.

² Of Inflammation, Chronic Disease, and Perforative Ulceration of the Cæcum and Appendix Vermiformis, *Medico-Chirurgical Transactions*, London, 1837, vol. xx. p. 200.

tion is distinguished. He reports eight cases, of which three depended upon perforation of the appendix.

Albers,¹ 1838, goes one step farther in making a distinction between acute typhlitis and perityphlitis. Acute typhlitis he considers principally an affection of the mucous membrane of the cæcum, complicating dysentery and enterocolitis; it may, however, occur spontaneously, with severe symptoms, pain, frequent diarrhœa, fever, and quick pulse; the inflammation may extend to the peritoneum, resulting in inflammation of the retrocæcal tissue, although this is rare. The description of the second form, perityphlitis, is that of a typical appendicitis. He believes, however, that it originates primarily in the retroperitoneal tissue, from catching cold or overeating, suppurates, and perforates secondarily into the cæcum or the appendix. "It is not clear, however, why the processus vermiformis so often should be implicated, as the disease generally perforates the cæcum."

Grisolle,² 1839, gives an almost correct description of the pathology, in a lengthy article, in which he reports sixty-three cases of phlegmonous tumors in the iliac region, twelve of which he had observed himself. He excludes those inflammations which depend upon puerperium. He objects to the common belief that these inflammations originate from an acute or a chronic inflammation of the mucous membrane of the ileocæcum, extending into the cellular layer, a proceeding which he would consider exceedingly rare, so much more as we do not see such inflammations originate from other mucous membranes.

¹ Geschichte der Blinddarm-Entzündung, Beobachtungen auf dem Gebiete der Pathologie und pathologischen Anatomie, Bonn, 1838, 2d Theil, pp. 1 to 23.

² Histoire des tumeurs phlegmoneuses des fosses iliaques, Archives générales de Médecine, 1839, vol. iv. pp. 34, 137, and 293.

Besides, the inflammation resulting from typhoid fever does not extend into the cellular tissue, even when ulceration and perforation are present. He also objects to the belief that constipation is the exciting cause, as it was found in only one case, and in that the patient died of gangrene of the appendix, "an accident which may result from a kind of strangulation from accumulated fæces in the appendix." Perforations of the cæcum and the appendix occur either spontaneously or after gangrene, dependent upon foreign bodies or hardened fæces, and the resulting inflammation is analogous to that in the cellular tissue around the anus, dependent upon a fissure or ulceration, through which the fecal material may reach the cellular tissue in the neighborhood. If this perforation occupies the posterior wall of the cæcum, which does not possess a peritoneal covering, the fecal material may directly enter the cellular tissue, but a quickly fatal peritonitis will result if the perforation takes place in the anterior wall of the cæcum or in the appendix, unless adhesions form and make the abscess circumscribed. Death may occur in these cases without inflammation appearing in the cellular tissue of the iliac region, or secondary perforation of the abscess may take place into the cellular tissue. As causes of phlegmonous abscesses he mentions contusions, sprains, ball-playing, and particularly perforation of the cæcum and appendix from gangrene.

Rokitansky,¹ 1843, gives a clear description of diseases in the appendix and their terminations in local abscesses, in diffuse peritonitis, and particularly in chronic processes. They are invariably the result of fecal matter and foreign

¹ A Manual of Pathological Anatomy, translated by Sieveking, Philadelphia, 1855, vol. ii. p. 89.

bodies having become lodged and hardened in the appendix. The disease may exist for a long time as blennorrhœa, and is accompanied with thickening of the coat and frequent exacerbations leading to ulceration. In favorable cases the appendix partially or entirely shrivels up, and forms a lead-colored or slate-colored solid body,—*i.e.*, appendicitis obliterans,—or obliteration occurs followed by a metamorphosis analogous to dropsy of the gall-bladder,—*i.e.*, cystic dilatation and empyema. Typhoid and tuberculous affections frequently extend to the appendix, and both may be followed by perforation.

Voltz,¹ 1843, reports six cases with their autopsies, and gives the same pathological description as Rokitansky, particularly of chronic cases. The greatest importance of his paper is in regard to treatment. He advises under all circumstances to avoid purgatives and to use tincture of opium, five drops every quarter hour, or from half a grain to a grain of opium every hour, and after several days of constipation (7) to use suppositories and small enemas.

Lewis,² 1856, still considers the milder forms of catarrhal inflammation to be of cæcal origin. He gives a clear and correct description of the symptoms, and regards the prognosis as being always unfavorable. At least one-half of the cases are under twenty years of age, four-fifths of them being males. Foreign substances, particularly indurated fecal masses in the appendix, are the immediate cause. In a large proportion of cases fatal peritonitis re-

¹ Ueber die Verschwärung und Perforation des Processus vermiformis, bedingt durch fremde Körper, Archiv für die gesammte Medicin, 1843, Band iv. p. 305.

² A Statistical Contribution to our Knowledge of Abscess and other Diseases consequent upon the Lodgement of Foreign Bodies in the Appendix Vermiformis, with a Table of Forty Cases, New York Journal of Medicine, 1856, vol. i., 3d Series, p. 328.

sults within five days; in other cases a localized abscess may be found in different places, according to the position of the appendix. He knows of no case which recovered where diffuse peritonitis was present. All his patients died except one, who recovered after seventy days of illness; a tumor which appeared in the inguinal region was incised and a piece of bone removed. One month later the patient died from another disease, and the appendix was found adherent in the inguinal canal. The importance of his paper consists in his advising surgical treatment. Considering the certainty of death without surgical help, he is in favor of making a free incision down upon the tumor and evacuating the pus, but it must be done early and not be delayed on account of absence of fluctuation.

Bamberger,¹ in 1858, still maintains the cæcal theory in the lighter cases, while he believes the severe cases depend upon perforation of the cæcum or appendix, most frequently the latter (ten times in twelve cases). He reports ten cases, all fatal, three of which were cases of localized peritonitis and seven of diffuse peritonitis. He advises opium in large doses as the most rational treatment, and uses cathartics only in cases dependent upon coprostasis, when no symptoms of peritonitis are present, or in increasing meteorism with threatening paralysis of the bowels and fecal vomiting.

Leudet,² 1859, at last gives up the cæcal theory, and states that perforation of the appendix is much more common than all other perforations of the intestines, that ulceration of the appendix is very frequent in phthisis

¹ Ueber die Perforation des wurmförmigen Anhangs, Verhandlungen des physikalisch Med. Gesellschaft in Würzburg, 1859, Band ix. p. 123.

² Recherches anatomo-pathologiques et cliniques sur l'ulcération et la perforation de l'appendice ileo-cæcal, Archives générales de Médecine, 1859, vol. ii. p. 315.

with ulcerations of the cæcum, and that it is caused by enteric, tuberculous, and typhoid ulcerations and by foreign bodies. It may lead to primary general peritonitis, fortunately rare (he had only one in forty-three cases), or to secondary peritonitis, by rupture of a circumscribed abscess, which is quite frequent among the coils of intestines, or between them and the anterior abdominal wall; or the pus may be found beneath the aponeurosis in the iliac region. These abscesses may also perforate into the cæcum, rectum, vagina, bladder, or outward. As complications he mentions abscesses of the liver and pylephlebitis of the portal vein; he advises against purgatives, and recommends opium and belladonna in large doses.

From Leudet to our days there is little mention of the cæcum, and the appendix is recognized as the point of origin in the great majority of cases. The efforts of physicians and surgeons are directed towards improving the prognosis, which during the antiphlogistic treatment was invariably fatal. Operative measures came to the front little by little, opium treatment first having more or less displaced the antiphlogistic treatment.

Willard Parker,¹ 1867, recommends extraperitoneal operation after the fifth and before the twelfth day, and reports four successful cases. Gouley,² 1875, goes a step farther, by recommending extraperitoneal operation earlier (seventh or eighth day), even before fluctuation, in order to prevent rupture into the peritoneum. He reported twenty-five cases with two deaths, from different authors. Gurdon Buck,³ 1876, emphasizes this suggestion, report-

¹ An Operation for Abscess of the Appendix Vermiformis Cæci, New York Medical Record, 1867, vol. ii. p. 25.

² Transactions of the Medical Society of the State of New York, 1875, p. 345.

³ On Abscesses in the Lower Abdominal Cavity and its Parietes, New York, 1876.

ing thirteen successful cases from different authors, two of which he had operated on himself. With,¹ 1879, again calls attention to the strict opium treatment with avoidance of all cathartics, emphasizes the importance of the peritoneum, and introduces a new name, peritonitis appendicularis. He reports thirty cases with a mortality of forty per cent. Fitz,² 1886, treats exhaustively of the diseases of the appendix, producing many statistical facts in regard to frequency, foreign bodies, coprolites, and time of occurrence of perforation, and recommends operation.

Henry B. Sands,³ 1888, reports the first successful case of laparotomy inside of forty-eight hours with extirpation of the appendix and drainage of the abdominal cavity. N. Senn,⁴ 1889, reports two cases of laparotomy for chronic recurring cases. Robert Weir,⁵ 1889, lays down the rule that if symptoms indicate an increase of the local trouble for forty-eight hours, with or without tumor, laparotomy should be done immediately, and that, if general peritonitis be found during an operation, irrigation and drainage should be employed. McBurney,⁶

¹ Festskrift ved Firehundredaarsfesten ved Kjöbenhavns Universitet, 1879.

² Perforating Inflammation of the Vermiform Appendix, with Special Reference to its Early Diagnosis and Treatment, American Journal of the Medical Sciences, 1886, and Transactions of the Association of American Physicians, 1886.

³ An Account of a Case in which Recovery took place after Laparotomy had been performed for Septic Peritonitis due to Perforation of the Vermiform Appendix, New York Medical Journal, February 25, 1888.

⁴ A Plea in Favor of Early Laparotomy for Catarrhal and Ulcerative Appendicitis, with Report of Two Cases, Journal of the American Medical Association, November 2, 1889, p. 630.

⁵ Medical News, April 27, 1889.

⁶ Experience with Early Operative Interference in Cases of Disease of the Vermiform Appendix, New York Medical Journal, December 21, 1889.

in 1889, is the first to report a series of early operations. Of his eight cases seven recovered and one died of peritonitis.

It is, however, first in 1891, after the discussion in the New York State Medical Society, that the surgical treatment suddenly comes to the front. McBurney's paper,¹ read before that society, contains a report of twenty-four early operations, twenty-three of which recovered, and in all of which life was seriously threatened. Six were operated on during the second day, fourteen on the third, two on the fourth, and two at the end of the first week. Since that time an enormous literature has appeared, principally about the treatment of the different forms of appendicitis. In America the fight is led by McBurney, Stimson, Richardson, Gerster, Wyeth, White, Fenger, Fowler, Deaver, Morris, Bull, Meyer, Bryant, Keen, Price, and a host of others, whose writings are found in different medical journals; in Germany, by Sonnenburg, Renvers, Mikulicz, Schede, Finkelstein, and Helferich; in France, by Talamon, Dieulafoy, Maurin, and Tuffier; in Switzerland, by Sahli, Roux, and others; in Sweden, by Lennander, Eckhorn, and Wallis; in England, by Treves, Page, Hawkins, and Kelynack. A review of the writings of all these authors and of the present state of the appendicitis question in different countries will be found in the section on treatment.

ANATOMY.

The appendix vermiformis is an organ of unknown function, in the form of an elongated cylindrical tube, taking its origin from the cæcum, and consisting of a mucosa rich in lymphoid elements, an outer and an inner

¹ Annals of Surgery, April, 1891.

muscular coat, and a peritoneal covering in direct communication with that of the cæcum. This extends from the lower end of the cæcum as a triangular fold, the mesenteriolum or meso-appendix. While, as a rule, the peritoneal covering of the cæcum is incomplete behind, thus bringing the structure in contact with the connective tissues of the iliac fossa, and only rarely forming a complete mesocæcum, the appendix is almost always completely invested with peritoneum. It is found only in man, the man-like apes, and the wombat, and is probably a rudiment of the enormous cæcum of quadrupeds of the rodent type.¹

LENGTH OF THE APPENDIX.

Bryant² states that the average length in males is three and a half inches, in females three and one-tenth inches, the appendix in males being four-tenths of an inch longer. The longest in a series of ninety males was eight and one-fourth inches; fifty per cent. were from four to six inches, and four were only between a half-inch and an inch long. The longest in a series of forty-one females was seven inches, the shortest one inch.

Ribbert³ found the appendix longest in early adult life, after which it tends to become shorter. The relative length is much greater in infants than in adults. Its relation in length to the large intestines is in the new-born as one to ten, in adults as one to twenty. Ferguson⁴ gives from two hundred examinations four and a half inches as the average length.

¹ Harrison Allen, *System of Human Anatomy*, p. 653, Philadelphia, 1893.

² *Annals of Surgery*, February, 1893.

³ *Virchow's Archiv*, 1893.

⁴ *American Journal of the Medical Sciences*, January, 1891.

DIAMETER.

The diameter, according to Bryant,¹ is in males one-fourth of an inch, and, on an average, one-tenth of an inch more than in females. Ferguson² gives the diameter as that of a No. 9 bougie, English scale. The greater the diameter the greater the probability of there being fecal matter and foreign material in it. Bryant found fecal matter in seventy per cent. of males and in thirty-five per cent. of females.

POSITION.

The position of the appendix is not constant, although the insertion into the cæcum is approximately constant. Bryant³ found the appendix in one hundred and forty-four examined cases thirty-two times behind the cæcum, thirty-four times on the inner side of the cæcum and downward towards the pelvis, five times straight down in the iliac fossa, nine times outward and on the outer side of the cæcum, more or less high up, and once on the inner side high up towards the liver. Hawkins⁴ found by examination of one hundred bodies the appendix in thirty-eight cases running up along the left border of the cæcum, or lying on the psoas muscle pointing in an upward and inward direction; in twenty-six cases behind the cæcum, either curled up or running up for a variable distance; in seventeen cases down in the pelvis; in nine cases on the outer side of the cæcum; in six cases running almost transversely inward across the psoas, and in four cases curled up below the cæcum. It has, when unusually long, been found lying with its tip on the left psoas muscle. Out of two hundred cases examined by Ferguson² he found the appendix nineteen

¹ Loc. cit.² Loc. cit.³ Loc. cit.⁴ On Diseases of the Vermiform Appendix, London, 1895, p. 17.

times on the outer side of the cæcum, eleven times downward, eighteen times inward, seventy-five times in relation with the posterior surface of the cæcum, and seventy-seven times in such a way that perforation would take place into the retroperitoneal tissue.

Turner¹ found the appendix, in eighty-three cases in which it was free in the abdominal cavity, fifty-one times hanging down in the pelvis and twenty times passing transversely over the psoas muscle towards the promontory. An especially frequent anomaly is the location behind the cæcum, which occurred in twenty-two cases, in six of which it was wholly or partly extraperitoneal. In such cases, if perforation occurs, we get a perityphlitis in the shape of a phlegmonous inflammation in the retro-cæcal tissue; otherwise the inflammation is always intraperitoneal.

These statistics show how little constancy there is in the position of the appendix, and explain how purulent collections may occupy different positions, according to the position of a perforated appendix.

INSERTION.

Bryant² found the appendix arising in forty-seven out of eighty-two male cases one inch below the ileocæcal valve posteriorly; in ten cases, three-fourths of an inch below and posteriorly; in seven cases, one and one-half inches below and posteriorly; just below in one case; one inch below and back of the valve in five cases, and one and one-half inches below in six cases. In one case only it was inserted to the apex of the cæcum. The result was very much the same in females. He concludes that the

¹ Quoted by Fowler in *Annals of Surgery*, May, 1893.

² *Loc. cit.*

origin of the appendix in one-half of all cases, males or females, is one inch below the valve on the posterior surface of the cæcum.

MESENTERIOLUM.

The same inconstancy is found in regard to the length of the mesenteriolum as in regard to the position of the appendix. Hawkins¹ found it sometimes absent, so that the appendix was quite free in the abdomen. It often has the appearance of being too short, the result of which is that the appendix is curled spirally and sometimes bent on itself. Wyeth² found that the mesenteriolum does not always cover the appendix with peritoneum, but at times leaves a slight surface upon the posterior aspect uncovered, in common with the cæcum. Ferguson³ found this condition present quite frequently. In two hundred cases the appendix was covered by the mesenteriolum seventy-seven times in such a way that perforation could take place only into the retroperitoneal tissue. Maurin,⁴ on the other hand, mentions, from a study of one hundred and twelve cases of all ages, that the appendix in all of them was completely surrounded by the serosa and quite free in the abdominal cavity.

In regard to length, Bryant⁵ found the appendix in forty per cent. of examined cases perfectly free in the abdominal cavity, without a mesenteriolum, while sixty per cent. had shorter or longer mesenteriola. Lockwood and Rollerston, quoted by Kelynack,⁶ state that the mesen-

¹ Loc. cit., p. 18.

² Southwestern Medical and Surgical Reporter, July, 1896.

³ Loc. cit.

⁴ Quoted by Talamon, Appendicitis and Perityphlitis, translated by Hurd, Detroit, 1893, p. 28.

⁵ Loc. cit.

⁶ Pathology of the Vermiform Appendix, London, 1893, p. 31.

teriolum seldom reaches more than half or two-thirds of the way along the appendix. Kelynack has examined eighty cases in regard to this point. In sixty-four cases it extended along the whole length of the appendix, while it covered less than half the appendix in but two cases.

The relation of the mesenterium to the appendix is of great etiological importance. Bryant considers an attack of appendicitis in patients in whom the mesenterium is wanting much more severe and rapidly progressive than in those patients who are provided with mesenteria reaching to or near to the tip. Gangrene occurs oftener in such cases and always on the distal side of the mesenterium. On the other hand, in appendices which are perfectly covered with a mesenterium, we shall be more apt to meet a septic lymphangitis extending between the two layers of the mesenterium backward, and forming a retroperitoneal abscess. When I have met with gangrene and perforation with subsequent diffuse peritonitis, it has always been in appendices without mesenteria or on the distal side of a short mesenterium.

HISTOLOGY.

The structure of the appendix is much like that of the cæcum, except that it is rich in lymphoid cells, and has in relation to its size a large absorbent mucous surface. The mucosa consists of a retiform tissue with lymphoid cells in its meshes, either infiltrating the whole mass or found in masses and conglomerations between the glands. The mucosa is bounded by a basement membrane and covered with a columnar epithelium.¹ Numerous tubular glands, the crypts of Lieberkühn, extend into the retiform tissue, and between these the lymphoid masses

¹ Hawkins, loc. cit., p. 20.

are found in the deepest part of mucosa and submucosa. Hawkins states that the amount of lymphatic tissue has no relation to the age of the individual, while Kelynack¹ maintains that in children the lymphoid element is usually more abundant, although it may be found very abundant in those well advanced in life.

The appendix has two muscular coats. The inner one consists of plain muscular fibres disposed in a circular manner and variable in thickness. Hawkins states that it may form a third of the thickness of the wall in normal specimens. The outer muscular coat consists of thinner longitudinal fibres.

The artery, a branch of the superior mesenteric, passes along the free edge of the mesenterium, if this is present; otherwise it extends beneath the peritoneal covering² and ramifies in the submucosa. Lennander³ states that it has two branches, both originating from the superior mesenteric, the smaller one from the anterior side, and the larger one from the posterior side of the cæcum; the latter passes down into the mesenterium from one to three millimetres from the wall of the appendix and gives branches to both sides of the appendix. In short mesenteria it is found close to the wall along its whole length. White⁴ mentions a statement of Clado, that a fold of peritoneum, containing an additional artery, passes in females from the right ovary to the mesenterium, thus augmenting the blood-supply to the appendix, and perhaps explaining the less frequent occurrence of appendicitis in females.

¹ Loc. cit., p. 56.

² Deaver, A Treatise on Appendicitis, Philadelphia, 1896, p. 30.

³ Ueber Appendicitis, Wien, 1895, p. 17.

⁴ Address on Appendicitis, Therapeutic Gazette, June 15, 1894.

The lymphatics pass to a chain of glands in the angle formed by the junction of the appendix with the cæcum.

The nerves take their origin from the superior mesenteric plexus of the sympathetic. The so-called Gerlach's valve is formed by a slight duplication of the mucosa at the orifice, running half-way round. It is in no sense a complete valve.

FUNCTION.

Richard Berry¹ states that the appendix is represented in mammals by a mass of lymphatic tissue at the apex of the cæcum, and that its function is the production and exudation of leucocytes. This anatomical fact is of interest in regard to the etiology of appendicitis. Lymphoid tissue is particularly predisposed to acute inflammatory affections, as, for instance, in the tonsils of children; and the frequent attacks of appendicitis in youth may perhaps occasionally be thus explained.

Bland Sutton² takes the same view, and thinks that the appendix might be regarded as an abdominal tonsil, possessing adenoid tissue and glands, and that this resemblance might explain pathologically the morbid phenomena. Many people, for instance, suffer from simple tonsillitis, and a similar condition in the appendix would account for the cases of appendicitis which recover under medical treatment. The very acute quinsies, with tonsillar abscess, correspond to sloughing appendicitis. He would also attribute the greater frequency of appendicitis in young people to the fact that affections of adenoid tissue are more common in early life than in adult years.

¹ Journal of Pathology and Bacteriology, April, 1895.

² Lancet, 1891, p. 547.

ETIOLOGY.

During the first half of the present century abscesses in the ileocæcal region were ascribed to diseases of the cæcum. Isolated cases of perforation of the appendix had been described, but their pathological frequency and importance as an etiological factor had been overlooked, and it is only during the last decade that the appendix has been recognized as the almost exclusive cause of these inflammations. Hand in hand with this discovery has gone the introduction of early operative treatment and increasing doubt as to the efficacy of medical treatment. The honor of this discovery belongs principally to American surgeons, and the disease is recognized in America as an exclusively surgical lesion. Scarcely a surgeon can be found in a large town who cannot show statistics of operations for appendicitis, and uniformly with the same result,—recovery, as a rule, in cases in which there is no diffuse peritonitis. Nor is it to be wondered at that this form—diffuse peritonitis from perforation, primary or secondary—is by most American surgeons looked upon as a calamity which may be prevented by early operation in the majority of cases, and that therefore early operation has been recommended as the proper treatment for most cases, as we are unable to state early in a given case whether it will be a mild one or a serious or even fatal one. The prevalence of the cæcal theory for so long a time may probably be explained by the rarity of post-mortem examinations, and then only in diffuse cases, in which it was difficult to find the primary lesion. It is exceptionally that the cæcum forms the point of origin.

FREQUENCY OF ORIGIN IN THE CÆCUM.

Einhorn found in one hundred cases the point of origin in the appendix in ninety-one per cent. and in the cæcum

in nine per cent.; Wallis in fifty-two cases found the origin in the appendix in eighty-nine and eight-tenths per cent. and in the cæcum in ten and two-tenths per cent.¹ Renvers² found in five hundred and eighty-six autopsies after perityphlitis the appendix perforated in four hundred and ninety-seven cases, and expresses his belief that five-sixths of all fatal cases depend upon perforation of the appendix itself, and that perforation of the cæcum occurs in but thirteen per cent. In another series of two hundred and eighteen autopsies after perityphlitis he found perforation of the cæcum twenty-nine times.

Sonnenburg³ acknowledges numerous reports in the literature of perforations of the cæcum, particularly from foreign bodies. The large majority are, however, secondary, an abscess perforating into the cæcum. Volkmann thinks that typhlitis and perityphlitis always depend upon perforation of the appendix itself, save in the case of tuberculosis and typhoid ulcers of the cæcum itself.

Talamon⁴ says that early operations show that there never, or almost never, exists inflammation or perforation of the cæcum, and that we are warranted in distrusting old observations, taken at a time when the true state of the appendix was not suspected. Neither the tumor nor the pains nor the inflammatory symptoms are due to any lesion of the walls of the cæcum proper, although, without doubt, the cæcum may be involved, but always in an accessory or secondary manner. The peritoneal covering of the cæcum is always the most rapidly and most profoundly affected, and the fibrinous membranes here thick-

¹ From Hygieia, reported in Virchow's Jahresbericht der gesammten Medicine, Berlin, 1895, p. 467.

² Deutsche Medicinische Wochenschrift, January 29, 1895.

³ Deutsche Zeitschrift für Chirurgie, Band xxxviii. p. 159.

⁴ Loc. cit., pp. 17 and 23.

est and most abundant on account of its intimate relation to the perforated appendix. The abscess frequently bursts into the cæcum, as the appendix often lies along it. The defect is largest on the serosa and smallest on the mucous membrane. The opposite would be the case if perforation took place from the mucosa outward. The tumor, which advocates of the cæcal theory believed to be the cause, is only the result, and appears first after several days. The appendix, he concludes, must be primarily affected in order to produce the symptoms described under the name of typhlitis.

Hawkins¹ states that almost every case of inflammation in the right iliac fossa which has proved fatal has been found to be due to disease of the appendix, and that a perforating ulceration of the cæcum, though it does certainly occur, is so rare that it may be disregarded. The cæcum may, of course, be affected during typhoid fever, dysentery, or tuberculosis, but the affection is then a part of a general disease and not localized in the ileocæcal region. An ulceration of the cæcum may, nevertheless, occasionally occur under these circumstances, although such ulcers, as a rule, do not perforate.

Perforating ulcers of the cæcum have also been supposed to be due to stercoral typhlitis from retention of fæces. This would in mild cases produce catarrh of the mucous membrane of the cæcum, without ulcerations, but giving symptoms of pain without fever, or with a moderate fever, and a distinct, early appearing tumor. I believe this condition to be more frequent than is supposed. Such cases are almost never fatal and recover promptly by the use of purgatives. The symptoms, true enough, with the exception of the early tumor, are those

¹ Loc. cit., p. 10.

of a mild appendicitis, but the etiology is quite different, and the mortality not to be compared with that of true appendicitis. Renvers's statistics of two thousand cases from the German army (to be mentioned later), with a mortality of about four per cent., consist, I believe, largely of such cases.

I must therefore agree with Hawkins¹ that there is no evidence in support of the cæcal theory, but that there is a perfect gradation from the cases of sudden, fatal general peritonitis to those with but slight pains and tenderness in the iliac region. Moreover, these degrees alternate in the same subject, a severe and fatal attack of peritonitis following one or more slight attacks, or a more severe attack being followed by several of the milder variety.

The *causes* of appendicitis are many and varied, but may with advantage be divided into predisposing and exciting causes.

Under predisposing causes I will mention

- Anatomical position and structure,
- Indigestion and constipation,
- Previous attacks,
- Constitutional disturbances,
- Age, sex, and nationality.

Under exciting causes :

- Concrements and foreign bodies,
- Micro-organisms,
- Strictures, kinks, and mechanical obstructions,
- Traumatism,
- Overeating,
- Actinomyces.

¹ Loc. cit., p. 13.

PREDISPOSING CAUSES.

Anatomical Position and Structure.—John Wyeth¹ calls attention to the unfortunate position of the appendix as an etiological factor. It is subjected to distention from semi-liquid ingesta by gravitation from the cæcum, while it, on the other hand, empties itself with difficulty on account of its weak muscles. Moreover, the weight of the bowels tends to interfere with the proper supply of blood, by direct pressure on the single artery. People of sedentary habits and with chronic constipation suffer more frequently on account of increased pressure. Finkelstein² thinks the predisposition to stagnation is increased by the disproportion of the length of the appendix to its lumen, it being as sixteen to one, and often much more, and of the disproportion of the size of the absorbing and secreting surface to the lumen. Every irritation, which is followed by increased secretion, will fill the cavity to overflowing, while the swelling of the mucous membrane, particularly at Gerlach's valve, will prevent its discharge into the cæcum. The relatively large absorbing surface favors absorption of the fluid contents, while the solid parts left behind may form the nucleus of a coprolite.

Another reason for the frequency of diseases in the appendix is that, on account of its anatomical position, it frequently suffers in different severe abdominal lesions, such as typhoid fever, dysentery, and tuberculosis, which, at best, may leave scars and in that way predispose to attacks. Its low vitality, its limited blood-supply, with no anastomosis to make up for the deficiency of supply, its richness in lymphoid tissue, are all characteristics which favor an attack.

¹ Southwestern Medical and Surgical Reporter, July, 1896.

² Deutsche Zeitschrift für Chirurgie, 1896, Band xxxviii. p. 179.

Indigestion and Constipation.—Constipation, diarrhœa, and digestive disturbances favor the development of appendicitis. The appendix has a relatively low vitality; its one source of blood-supply is easily interfered with by twisting and dragging; it is connected by short and scanty folds of peritoneum with portions of the digestive tract especially liable to changes in form and size, which thus easily produce torsion and tension;¹ furthermore, a micro-organism, capable of great virulence if epithelial exfoliation occurs or if stagnation takes place, is almost constantly present. Constipation and digestive disturbances alone would probably not produce an appendicitis; but add to them an abnormal position of the appendix, by which stagnation is favored, and the result will sooner or later be an attack of appendicitis.

Fenger,² Kümmel,³ and the late Dr. Iversen⁴ emphasize the importance of a catarrhal inflammation of the cæcum as the cause of appendicitis, particularly because fecal concretions are found only in a minority (thirty-nine per cent.) of the perforating cases. They believe that swelling of the mucous membrane leads to stenosis at Gerlach's valve and retention of secretion, and that infection with microbes then easily occurs. Fecal concretions, however, constitute only one of many causes of appendicitis, are often absent, and probably give no symptoms as long as they are small and the communication with the cæcum is free. Iversen believed this catarrhal inflammation might disappear and perfect recovery take place after one or more attacks,

¹ White, *An Address on Appendicitis*, *Therapeutic Gazette*, June 15, 1894, p. 7.

² *Remarks on Appendicitis*, *American Journal of Obstetrics*, 1893, vol. xxviii. No. 2.

³ *Langenbeck's Archiv für Klin. Chirurgie*, Band xliii. p. 466.

⁴ *Forhandlingerne of Kjöbenhavns, Med. Selskab*, 20 Januar, 1891.

and only slight adhesions be found as proof of a previous inflammation, while Fenger considers it more probable that partial or total obliteration of the appendix occurs as a result of an attack. Lennander¹ found a history of constipation or gastro-intestinal disturbances in twenty-three of his sixty-nine cases; in my statistics of seventy-five cases only eight had such a history.

Previous Attacks.—Most authors agree that an attack of appendicitis predisposes to new attacks unless the appendix happens to be totally destroyed by gangrene, complicated by a local circumscribed abscess, or else obliterated by destruction of its epithelium and cicatricial retraction of new-formed tissue. The question is intimately connected with another question, whether complete recovery ever occurs after a genuine attack, and with still another question, whether after an attack the appendix ought to be removed as a prophylactic measure. Both of these questions will be discussed later.

Hawkins² thinks that every patient who has once had an attack of perityphlitis is liable to a second attack as long as his appendix remains unobliterated or until it is removed. In two hundred and fifty cases he found a history of previous attacks in fifty-nine (twenty-three and six-tenths per cent.). Fitz³ had forty-four per cent. of recurrences, and states that previous attacks are rare only in cases of acute general peritonitis. My cases show previous attacks in thirty-five cases (forty-seven per cent.).

Albert Wood,⁴ who has made collective investigations in regard to the frequency and time of occurrence of second attacks, for the purpose of deciding the risk to life

¹ Ueber Appendicitis, Wien, 1895.

² Loc. cit., p. 111.

³ Boston Medical and Surgical Journal, June 19, 1890, p. 620.

⁴ Medical Record, August 22, 1896, p. 257.

insurance companies, finds that in cases of circumscribed abscess treated by incision without removal of the appendix recurrence occurs in less than five per cent., and then mostly within a few months.

Fowler¹ says, in regard to chronic appendicitis, that the patient may become apparently convalescent, the pains and all febrile symptoms disappearing. He may even be permitted to resume his vocation. Within a few weeks, or even earlier, a relapse takes place, with symptoms perhaps more violent and threatening than at first. He believes that in these cases the mucous membrane and submucous tissue continue in a condition of subacute inflammation favoring relapses.

Wood² gives the following figures showing the percentages of relapses and recurrences, as given by a few observers. Irish gave fifty per cent.; Richardson, forty-nine and four-tenths per cent.; Price, fifty per cent.; Ranzohoff, thirteen per cent.; Knaussold, twenty-three per cent.; Krafft, twenty-two per cent.; Porter, nine and five-tenths per cent.; Bryant, from eleven to seventeen per cent.; Sahli, twenty per cent.; Gage, thirty-three and five-tenths per cent. The average of these figures is twenty-nine and one-tenth per cent. Other authors put the percentage of relapses much higher. Wyeth thinks that, at most, twenty per cent. recover perfectly after one attack and without having a recurrence. Willy Meyer³ thinks even these figures too high, and believes that ten per cent. of perfect recoveries are nearer the truth. Lennander⁴ caps the climax by stating that all the patients whom he has observed for a sufficiently long time have had relapses.

¹ Annals of Surgery, January, 1894, p. 39.

² Loc. cit., p. 255.

³ Medical Record, February 29, 1896.

⁴ Ueber Appendicitis, Wien, 1895, p. 42.

Sonnenburg¹ warns against accepting implicitly physicians' reports of spontaneous recovery, partly because they count cases of simple appendicitis without exudation and partly because they give no reliable information about relapses. Surgeons, he says, often operate on cases which were discharged as recovered after the first attack under medical treatment.

The statistics mentioned above seem, at least, to justify the conclusion that previous attacks are an important etiological factor in about thirty per cent. of all cases, be this the result of strictures and mechanical obstructions forming in different parts of the lumen and preventing the appendix from emptying itself, and in that way favoring stagnation, be it from the formation of coprolites always ready to provoke new accidents, or be it that the lesion determined by the first attack persists in a sub-acute state.²

Constitutional Disturbances. — The appendix is, as stated, very rich in lymphoid tissue, which, as in the tonsils, has an inclination to be attacked by acute inflammations, particularly in young individuals. Appendicitis may, therefore, perhaps not always be dependent upon a local affection of the appendix itself.

Tuberculosis, too, is apt to attack lymphoid tissue, and might, therefore, be expected to be of frequent occurrence in the appendix. It is, nevertheless, the exception to find tuberculosis as a primary cause of appendicitis. Talamon³ calls such an affection a special specific appendicitis, absolutely different in its lesions, as in its evolution, from ordinary appendicitis, and, as a rule, starting in the

¹ Deutsche Zeitschrift für Chirurgie, 1891, Band xxxviii. p. 163.

² Talamon, loc. cit., p. 69.

³ Loc. cit., p. 68.

cæcum. Kelynack¹ maintains that it leads to perforation but rarely, and then much later in life than the acute forms of appendicitis. Fenwick and Dodwell² found the intestines affected five hundred times in eight hundred and eighty-three cases of phthisis,—*i.e.*, fifty-six per cent.,—of which the ileocæcal region was involved in eighty-five per cent. and was the only part attacked in nine and six-tenths per cent. The appendix itself was the only part of the intestinal canal attacked in seventeen cases,—less than one-half per cent.

Fitz³ found eight perforations of the appendix from tuberculosis in two hundred and fifty-seven cases.

Brazil and Frazer have mentioned several cases in which the cause was supposed to be *rheumatism* and which recovered promptly by the use of salicylate of sodium. Beverley Robinson⁴ also mentions the relation between rheumatism and appendicitis, and states that the symptoms disappear more quickly after the use of salicylate of sodium than after other remedies, and that suppuration may often be prevented by the use of this remedy. In a later article⁵ he emphasizes the same statement. It is difficult, however, to see that salicylate of sodium could have any influence on suppuration, which depends upon the presence of microbes. Many early cases recover by rest and appropriate treatment alone, and the supposed results of salicylates may only emphasize the correctness of the old sentence, *Post hoc, ergo propter hoc*.

Typhoid fever, eruptive fevers, and dysentery are supposed to be predisposing causes of appendicitis, on account of the scars which they may leave behind, and which may

¹ Loc. cit., p. 121.

² Quoted by Kelynack, p. 120.

³ American Journal of the Medical Sciences, October, 1886.

⁴ Medical Record, September 14, 1895.

⁵ Ibid., February 15, 1896.

keep up the tendency to distention of the intestines and chronic inflammation of the mucosa.¹ They are somewhat more frequent than tuberculosis as an etiological factor. Fitz² found five perforations of the appendix in one hundred and sixty-seven typhoid perforations,—*i.e.*, three per cent.,—and in two hundred and fifty-seven perforations of the appendix three cases due to typhoid fever.³ Kelynack⁴ has never seen a case of perforation, but in one case a distinct typhoid ulceration.

A case of perforation of the appendix due to typhoid ulceration came under my notice at the Sisters of Charity Hospital in Buffalo on August 19, 1896. The patient had been sick twenty-two days; he had had on the 3d, 6th, and 7th of August five copious hemorrhages from the bowels, but was considered convalescent, his pulse being 110 and his temperature normal. He suddenly expired, however, on August 19, with symptoms of shock. Post-mortem examination revealed in the ileum and cæcum twenty-three large typhoid ulcers in various stages of healing. Around the appendix, which was perforated, were found sixty grammes of fluid fæces. The appendix had a large perforation in its middle, the peritoneal covering around it being gangrenous. A large, irregular ulcer, of the same appearance as the ulcers in the ileum, but extending through all the tissues to the peritoneum, was found in the appendix. I have not been able to find any statistics bearing upon the frequency of dysentery as an etiological factor.

Age.—Appendicitis is undoubtedly most prevalent in

¹ Talamon, *loc. cit.*, p. 67.

² Transactions of the Association of American Physicians, vol. vi. p. 209.

³ American Journal of the Medical Sciences, October, 1886.

⁴ *Loc. cit.*, p. 124.

early adult life. Turner¹ thinks that this is due to the wider communication with the cæcum in childhood and early adult life, which favors the entrance of fecal material. Fitz,² in his statistics of two hundred and fifty-seven cases, found seventy-six per cent. under thirty years of age and almost fifty per cent. under twenty years of age. The youngest was twenty months old, the oldest seventy-eight years.

Hawkins³ found in two hundred and twenty-four cases from St. Thomas's Hospital eleven per cent. from five to ten years of age, forty-three per cent. from ten to twenty, thirty per cent. from twenty to thirty, eight per cent. from thirty to forty, six per cent. from forty to fifty, and nine-tenths per cent. over fifty years of age. Of my own seventy-five cases, nine were between five and ten years of age, twenty-one were between ten and twenty, twenty-four were between twenty and thirty, fourteen were between thirty and forty, five were between forty and fifty, and but two were above fifty years of age.

Sex.—Males are more predisposed to appendicitis than females, probably on account of the greater length of the appendix and the poorer blood-supply. White's⁴ statement, that a fold of the peritoneum containing an additional artery (according to Clado) passes in females from the right ovary to the mesenterium, giving greater blood-supply and preventing gangrene, is probably the correct explanation.

Fitz⁵ found eighty per cent. males and twenty per cent. females in statistics of two hundred and fifty-seven cases;

¹ Quoted by Fowler, *Annals of Surgery*, May, 1893.

² *American Journal of the Medical Sciences*, October, 1886.

³ *Loc. cit.*, p. 62.

⁴ *Therapeutic Gazette*, June 15, 1894, p. 3.

⁵ *Loc. cit.*

Hawkins,¹ seventy-two per cent. males and twenty-eight per cent. females in statistics of two hundred and twenty-four cases. I had forty-seven males and twenty-eight females in seventy-five cases, respectively sixty-two and thirty-seven per cent.

Nationality.—Lange² considers appendicitis unusually prevalent in America, and ascribes it to bad habits in eating too much and chewing the food too little, both leading to constipation. As a contributory cause he mentions the hurrying, restless lives, which lead to ignoring of the calls of nature, thereby producing fecal accumulations, with consequent troubles of the mucous membrane of the cæcum. The effect would, however, be more in the line of stercoral typhlitis than of appendicitis. I have little doubt that this affection is more prevalent than is generally supposed, and that the appendix is blamed for many troubles which ought to be ascribed to fecal accumulations in the cæcum. The question is of importance in regard to pathology and prognosis, and will be discussed later.

EXCITING CAUSES.

Coprolites and foreign bodies, such as stones of cherries and grapes, needles, and worms, constitute a most frequent exciting cause of appendicitis. The distinction between them has no interest except from an etiological point of view. The pointed foreign bodies, such as needles, act by simple traumatism; the round ones form the nucleus, occasionally, of a coprolite and act by pressure necrosis. Talamon,³ therefore, distinguishes two forms of appendicitis as originating from this source, traumatic and

¹ Loc. cit., p. 62.

² Medical Record, August 29, 1891, p. 245.

³ Loc. cit., p. 31.

stercoral. Coprolites are found much more frequently than foreign bodies.

Bryant¹ found in one hundred and twenty-four cases abnormal matter in seventy per cent. of the males and in fifty-six per cent. of the females. Renvers² found in four hundred and fifty-nine autopsies one hundred and seventy-nine coprolites and but sixteen foreign bodies; Fitz³ found coprolites in forty-seven per cent. of one hundred and thirty-two cases; Maurin,⁴ in fifty-six per cent. of sixty cases; Krafft⁵ in one hundred and six cases had thirty-six coprolites but only four foreign bodies. Murphy⁶ had in one hundred and forty-one operations coprolites in thirty per cent. and foreign bodies in three and five-tenths per cent.; I in seventy-five operations found twenty-six coprolites and one foreign body. Gallant⁷ found in two hundred operative cases foreign bodies, exclusive of coprolitis, in but one case; Hawkins,⁸ none in sixty-seven fatal cases. These examples are sufficient to show the excess of coprolites over foreign bodies, and the frequency with which the former are found.

Coprolites do not, as was formerly believed, enter from the cæcum, but are formed in the appendix itself, and do not, after all, consist of fæces, except perhaps in the centre, but of inspissated mucus and different salts, colored with fecal matter. The course of the appendix is often found in a direction diametrically opposite that of the cæcum, the opening into the appendix is small and

¹ *Annals of Surgery*, February, 1893, pp. 170 and 172.

² *Deutsche Med. Wochenschrift*, 1891.

³ *American Journal of the Medical Sciences*, October, 1886, p. 321.

⁴ Quoted by Talamon.

⁵ *Volkmann's Klinische Vorträge*, January, 1889.

⁶ *Journal of the American Medical Association*, March, 1894.

⁷ *Medical Record*, February 15, 1896.

⁸ *Loc. cit.*, p. 37.

oblique, and it has been shown experimentally to be very difficult to force fluids, even water, from the cæcum into the appendix. The experiments of Herman¹ also seem to prove that coprolites are formed in the appendix itself. He doubly severed a small part of the intestine, sutured both ends, after having first thoroughly cleaned the lumen, and thereafter sutured the bowel again. Everything which later was found in this little sausage-like piece of intestine must necessarily have originated from secretion of the bowel itself. He found in such a piece of bowel of a dog, killed sixteen days after the operation, a greenish-gray, solid mass, which looked like dry fæces in an icteric patient, but more homogeneous. The concrement contained bacteria, leucocytes, mucin, and fecal coloring-matter. Berry² saw a similar paste-like mass form in a centrally ligated appendix. He concludes, therefore, that concrements in the appendix form in the appendix itself and are due to secretion from the appendix. Ribbert³ states that but very small concrements consist of fecal particles. In larger concrements the centre only is fecal material, while the rest consists of concentric layers of mucus as soon as they surpass the normal diameter of the lumen of the appendix and commence to produce dilatation. This has also been proved microscopically by sections through a hardened appendix containing a concrement. Finkelstein,⁴ too, considers the concrements to be secondary formations in the appendix, as their concentric structure also seems to prove. Talamon⁵ is the only author I have come across who still holds that coprolites are formed in the cæcum. If formed in

¹ Archiv für die gesammte Physiologie, 1890.

² Loc. cit.

³ Virchow's Archiv, 1893.

⁴ Archiv für Klinische Chirurgie, Band xxxix.

⁵ Loc. cit., p. 32.

the appendix, they ought to have an elongated, cylindrical form, he maintains, and not be round. His views are evidently erroneous, as in the large majority of cases the coprolites are elongated and conform to the lumen of the appendix.

The action of the concretions is partly stenosis of the lumen, producing retention of mucus, partly irritation of the mucous membrane, followed by swelling with increased secretion and dilatation. Ulceration does not occur until the fecal mass acquires a certain degree of hardness, and thereby exercises a considerable degree of pressure upon the mucous membrane.¹ The hardness depends upon a deposition of carbonate and phosphate of lime upon the surface of the concrement. Reflex contraction of the muscles takes place, producing symptoms of appendicular colic, by which the pressure is increased, with the result that the epithelium is destroyed and the submucous tissue and finally the muscular coats disappear by pressure-necrosis. In some cases, however, there is no ulceration, but simply atrophy. Volkmann,² too, considers them to be the usual cause of typhlitis and perityphlitis, and therefore advises their removal by operation, if we aim at perfect recovery.

Microbes.—*Bacillus coli communis* is normally present in the bowels, and is, as a rule, innocent; but it becomes virulent when the bowel is the seat of inflammation, strangulation, or œdema, and sometimes when diarrhœa or even constipation only is present.³ Its distribution is not confined to the bowel. Welsh,⁴ found it present in one or more organs of the body in thirty-five of about

¹ Hawkins, loc. cit., pp. 34 and 35.

² Deutsche Med. Wochenschrift, 1889, No. 36, p. 753.

³ Hawkins, loc. cit., pp. 71 and 72.

⁴ Medical News, December 12, 1891, p. 670.

two hundred autopsies. He supposes that a lesion of the mucous membrane of the bowel had opened the way for the invasion of the bacillus into the blood-vessels or lymphatics, and hence into various organs. He has found it in blood, lung, spleen, kidney, peritoneum, bile-duct, gall-bladder, liver, lymphatic glands, testicle, tonsil, brain, and wounds. As a general rule, suppuration has been found whenever it was present, but in a number of cases it has been demonstrated in various organs without any noteworthy lesion. There is, therefore, no evidence that it does harm in these cases, although it cannot be stated positively that it is innocuous. Hence pathogenic powers may be attributed to it only when other causes of inflammation can be excluded. Welsh is inclined to the belief that it is innocent as long as it is surrounded by a healthy mucous membrane, but that it migrates and becomes pyogenic as soon as the mucous membrane becomes injured or inflamed. Other observations seem to prove that a lesion of the mucous membrane is not necessary, but that the bacillus may migrate through the intact wall and produce peritonitis. An observation of Fränkel, quoted by Hawkins, points in this direction. He injected caustics into the peritoneums of rabbits, producing peritonitis with an exudation which at first was sterile, but later, when purulent, became rich in colon bacilli. Hodenpyl¹ found in some cases colonies of the bacilli in the wall of the appendix, surrounded by exudates, but without any lesion of the mucous membrane. Hawkins² considers cases of idiopathic peritonitis probably due to migration of the colon bacillus through the wall of the bowel, although he acknowledges that it may not always be possi-

¹ New York Medical Journal, December 30, 1893, p. 777.

² Loc. cit., p. 65.

ble to detect disease of the mucous membrane of the appendix except with the microscope.

The colon bacillus is by no means confined to man. Marchall Flint,¹ of Chicago University, has examined bacteriologically the fæces of twenty-eight animals in Lincoln Park Zoological Garden. In fourteen of these he found the bacillus, either in pure culture or in numbers greatly preponderating over other forms present. All the carnivorous animals, with the exception of the wildcat, contained the bacillus, but it was observed not uncommonly too in the herbivora; it has also been found in the lower vertebrata, such as frogs and turtles.

That the colon bacillus is the most important etiological factor of appendicitis and peritonitis has been proved by numerous investigations and experiments. Hodenpyl² examined bacteriologically eleven cases, and found the bacillus coli in a pure culture in them all. In thirty-two out of thirty-five collected cases the bacillus coli was the only germ present. Bristow³ got a pure culture from the fresh exudations of lymph from the outer side of the appendix, also from the wall itself, from peritoneal exudation, and appendicular abscesses, both in the appendix itself and after perforation. Guinea-pigs died in twenty-four hours after injection into the peritoneal cavity of this culture, and new cultures grew by inoculation from the peritoneal exudation.

Hawkins⁴ found it fifty-seven times in sixty-one cases of general peritonitis or perityphlitis from disease of the appendix, and in fifty of these cases it was the only germ present. Park⁵ found it in acute perforative, gangrenous,

¹ Journal of the American Medical Association, February 29, 1896.

² Loc. cit., p. 777.

³ Annals of Surgery, January, 1894, p. 28.

⁴ Loc. cit., pp. 71 and 72.

⁵ Annals of Surgery, September, 1893.

and recurrent forms of appendicitis. Ekehorn's¹ experiments demonstrated their pathogenic *rôle* in lower animals, besides showing that their virulence was not as great when derived from cases of recurrent and chronic appendicitis as when taken from acute and rapidly progressing cases of appendicitis.

A pure culture of colon bacillus injected into a healthy peritoneal cavity acts, according to Ziegler,² in proportion to the amount injected. A small dose produces diarrhœa, followed by recovery; a somewhat larger dose produces localized purulent peritonitis; a still larger one produces a fatal, diffuse, fibro-purulent peritonitis, and, if very large, death from acute sepsis before peritonitis has time to develop. This shows that the peritoneum is able to overcome certain quantities of bacterial poison. Fowler³ considers that this bacillus is in the majority of cases the cause of appendicitis. Treves⁴ thinks two conditions necessary for the establishment of an appendicitis: such a condition in the bowel as will render the colon bacillus virulent and such a lesion in the appendix as will permit it to reach the peritoneum; the last condition, however, is not necessary, as it may start in the wall. Malvoz,⁵ of Liege, concludes that bacterium coli communis plays a more important *rôle* than has been imagined, and that it particularly is one of the most frequent causes of peritonitis originating in the intestines, although it would perhaps be rash to assert that all cases of inflammation of the peritoneum which originate in the intestinal tube depend

¹ Bacterium Coli Communis en orsak till appendicit, Centralblatt für Med., 1893.

² Therapeutic Gazette, June, 1894, p. 29.

³ Annals of Surgery, January, 1894, p. 31.

⁴ British Medical Journal, March 9, 1895, p. 517.

⁵ Le bacterium coli communis, Archives de Médecine expérimentale et d'Anatomie pathologique, 1891, p. 610.

exclusively on the microbe. Surgeon-General Sternberg,¹ of the United States Army, a well-known authority in bacteriology, says that bacillus coli is now known to be the usual cause of peritonitis.

There seems, therefore, little doubt that this bacillus may become pyogenic under favorable circumstances, that it is usually present in appendicitis, and that the majority of cases thereof depend upon its entrance into the wall of the appendix. Its virulence may also, perhaps, depend to some extent on the medium in which it grows. It grows exceedingly well in the secretion from the appendix. Roger and Josué² ligated the appendix in a rabbit, avoiding the vessels. Three months later the appendix was transformed into a cyst on the distal side of the ligature, and the dilated part contained pus with colon bacilli. They concluded that the bacillus coli becomes virulent when the secretion, on account of stricture, is prevented from entering into the cæcum. That strictures are an important etiological element in the development of appendicitis, on account partly of the stagnation they produce and partly of the rapid growth of the colon bacillus in the retained secretion, will be shown later.

The colon bacillus is, however, not the only germ found. Streptococcus pyogenes has often been found alone in pus and exudates from peritonitis, particularly post-operative and puerperal peritonitis. Staphylococcus aureus and staphylococcus albus have also been found alone, but, as a rule, in those forms of appendicitis which result from a suppurating salpingitis.

Hawkins³ believes that peritonitis resulting from infec-

¹ American Journal of the Medical Sciences, 1894, vol. cvii. p. 664.

² Semaine Médicale, 1896, Nos. 7 and 8.

³ Loc. cit., pp. 65 and 68.

tion from without, such as puerperal peritonitis, peritonitis after laparotomy, and peritonitis complicating pelvic diseases, depends upon streptococcus, often associated with staphylococcus, while peritonitis from perforation always depends upon the colon bacillus. We find, nevertheless, occasionally, these other germs in cases of pure appendicitis. Hodenpyl¹ found the streptococcus present alone in one case; in another, mixed with the colon bacillus.

Finkelstein² believes that the streptococcus and staphylococcus are the real pyogenic bacilli, and that the colon bacillus is comparatively harmless. He found the streptococcus twenty-eight times in forty-one cases. The bacillus coli, to be sure, was always found, as it belongs in the bowels. It grows very quickly and outstrips the other forms, and has, he thinks, for that reason been considered pathological. Microscopic examination of fresh pus also shows that bacillus coli is less frequent than the pyogenic cocci.

All authors, however, agree that some forms of bacteria are the main cause of appendicitis, under favorable circumstances, such as strictures, coprolites, and all the other etiological factors mentioned. Bacterial infection may, however, occur without fecal concretions being present, just as ulceration, perforation, and gangrene may take place without the presence of coprolites.

Prof. Cassaet³ has called attention to still another germ, the pneumococcus, which occasionally may produce a very dangerous form of peritonitis, greatly resembling appendicitis. The pneumococcus enters through the skin or intestines after traumatism, or is conveyed by the blood or

¹ Loc. cit., p. 777.

² Loc. cit.

³ Archives Clin. de Bordeaux, reported in Journal of the American Medical Association, October 29, 1896, p. 490.

lymphatics, and produces effusion into the peritoneum, with a tendency to circumscribed purulent collections. The mortality, he states, is seventy-five per cent., unless laparotomy with thorough irrigation of the abdominal cavity is performed, which brings the mortality down to twenty per cent.

Strictures, Kinks, and Mechanical Obstructions.—Strictures are, as previously mentioned, a frequent cause of the development of appendicitis, on account partly of the stagnation they produce, partly of the rapid growth of microbes in the retained secretion.

Prof. Dieulafoy¹ considers them of the greatest importance, and believes that appendicitis is always the result of the conversion of the appendix into a closed cavity, the closure taking place at any point in its lumen, and being due either to the progressive formation of a calculus or to local infection, analogous to obliteration of the bile-duct in catarrhal icterus, or to cicatricial retraction and formation of a fibrous stricture, analogous to the formation of a urethral stricture. Cystic dilatation takes place on the distal side of the stricture, the germs normally present in the appendix multiply and become virulent, and appendicitis is the result. Symptoms of appendicitis occur first, he believes, when this cystic dilatation has appeared. We have no means of discovering before that time the existence of a process which will infallibly result, some day, in an attack of that formidable disease.

Sonnenburg² also mentions, as a result of ulcerative catarrhal inflammation, stricture by cicatricial retraction, torsion, or bending, which may produce stagnation and lead to acute processes.

¹ Report of Proceedings of the Academy of Medicine in Paris, March 10, 1896, in *Medical Record*, March 14, 1896.

² *Loc. cit.*, p. 167

White¹ believes that a mechanical obstruction may be the only exciting cause, although bacterial infection usually, perhaps constantly, comes into play.

Hawkins² states that strictures may be found at any spot, but generally near the cæcal end. In some cases two or more strictures may be found at different points, between which the lumen is dilated. In other cases of obstruction he found this due to kinking of the tube by an acute bend, independent of any inflammation. These forms are more apt to be followed by an extreme degree of cystic distention, as the mucous membrane is intact. Nevertheless, at the point of the bend a stricture is apt to form, making the cystic formation permanent.

Lennander,³ who recognizes as primary cause the colon bacillus or other pathogenic bacteria, lays great stress on strictures and bends of the appendix, by which also the circulation is interfered with. The cæcum itself may produce more or less stasis by direct pressure on an appendix lying behind it in the retrocæcal fossa or buried in its wall.

That strictures are exceedingly frequent I have observed in my own cases, they being present in thirty per cent. They have an important bearing on the question of perfect recovery after an attack of appendicitis. While I do not deny that complete recovery may occur in the early and mild forms as long as the swelling of the mucous membrane is the principal pathological lesion, I believe, nevertheless, that such a result will be an exception, or almost an impossibility, as soon as chronic catarrh or ulceration with succeeding stricture occurs unless obliteration of the appendix takes place or it is destroyed by

¹ An Address on Appendicitis, Therapeutic Gazette, June 15, 1894.

² Loc. cit., pp. 29 and 32.

³ Loc. cit., p. 19.

gangrene. There is no reason whatever for believing that strictures may become more easily absorbed here than in any other place. There is probably always infiltration of the submucous tissue where there is chronic catarrh or ulceration, and a stricture once formed will not merely continue to exist, but will also prevent perfect recovery and form a most important etiological factor in new attacks.

Traumatism and Over-Eating.—A direct injury occasionally precedes an attack of appendicitis. Fitz¹ found this the cause nineteen times in two hundred and fifty-seven cases; Hawkins,² sixteen times in one hundred and ninety cases; I, four times in seventy-five cases. Hawkins mentions an indigestible meal as cause in twelve of one hundred and ninety cases, and thinks it possible that strong peristaltic movements were produced.

Actinomycosis.—Very few cases have been reported. Kelynack³ thinks there is but one case on record, reported by Dr. Ransom, of Nottingham, who suggests that probably a grain of corn, bearing the parasite, lodged within the appendix.

Lange,⁴ however, reports the case of a man, twenty-one years of age, with a large swelling in the iliac region, supposed to be a cold abscess due to tuberculous osteitis of the ileum. It was by incision found to be actinomycosis, and at the bottom of the large wound lay the perforated appendix. Later an ulcer formed from the ascending colon, through which half of the fecal matter was discharged. The patient recovered after resection of the appendix and ascending colon. The appendix was found long, hypertrophied, and containing pus foci, but

¹ American Journal of the Medical Sciences, 1886.

² Loc. cit., p. 77. ³ Loc. cit., pp. 127 and 129.

⁴ Annals of Surgery, September, 1896, p. 371.

without any more elements of actinomycosis. Lange has seen about thirty cases of actinomycosis in various parts of the body, and considers it to be much more frequent than is usually supposed.

PATHOLOGY.

FREQUENCY.

Appendicitis, in all its different forms, is of very frequent occurrence. Richardson¹ has examined the mortality-tables from the time when only cases with local abscesses of several weeks' duration were submitted to operation, while cases of gangrene, perforation, and diffuse peritonitis were buried with the diagnosis "inflammation of bowels." As a result of his investigations, he has come to the conclusion that appendicitis is the most important acute abdominal disease in our days and, with the exception of certain zymotic diseases, the cause of more deaths than any other abdominal affection. He is convinced that at least ninety per cent. of all deaths from inflammation of the bowels in young men are the result of appendicitis. Thus, in Boston during the five years 1880 to 1884, before we had commenced to operate for perforating appendicitis, two hundred and eighteen young men died of inflammation of the bowels, of which probably one hundred and ninety-four were the result of perforating appendicitis. Richardson concludes, from a personal experience with one hundred and eighty operative cases, that appendicitis, with very few exceptions, is the cause of all cases of local and diffuse peritonitis in young men.

During the same years, 1880 to 1884, there died in Copenhagen, according to the mortality-tables, one hun-

¹ American Journal of the Medical Sciences, 1894.

dred and sixty-eight men, besides one hundred and fifty-five women of peritonitis extra-puerperium, showing that there die of peritonitis in Copenhagen as many individuals yearly in proportion to the population as in Boston. It is at least probable that the cause is the same,—appendicitis. I mention this fact because the opinion seems prevalent that appendicitis is more frequently found in America than anywhere else. Toft's¹ investigations also showed the frequency of appendicular lesions, as he found it diseased in thirty-six per cent. of all post-mortem examinations.

Hawkins² made similar investigations on one hundred bodies of all ages, where death occurred from some other cause than appendicitis, examining all suspicious cases microscopically. In sixteen of these one hundred cases there was evidence of past or present disease of the appendix. Seven of them had chronic catarrh; four had total or partial obliteration of the lumen; five had ulceration due to pressure of a fecal mass. Hawkins concludes that there is ample evidence that appendicular disease is, at any rate, of frequent occurrence, and that we are justified in regarding the appendix as the sole cause of all cases of perityphlitis, mild or severe.

Ferguson³ found in twenty autopsies evidence of previous affection in but seven cases, while fifteen cases contained in addition to this foreign bodies or scybala. It is not mentioned whether the microscope was used in these investigations. Talamon⁴ concludes from different statistics that we meet appendicular lesions in twenty per cent. of all subjects who have succumbed to divers affections.

¹ Om ulceration og perforation of Processus Vermiformis, Kjöbenhavn, 1868.

² Loc. cit., p. 23.

³ American Journal of the Medical Sciences, 1891.

⁴ Loc. cit., p. 29.

Wallis's¹ examinations from Sabbatsberg Hospital, in Stockholm, showed that death from appendicitis formed one and one-tenth per cent. of all fatal cases from 1879 to 1891, and occurred twice as often in males as in females. In males between the ages of ten and thirty years it formed four per cent. of all fatal cases.

CLASSIFICATION.

The different forms of lesions in the appendix present certain characteristics in regard to the pathological condition, extent, severity, symptoms, etiology, etc., but, nevertheless, there is a perfect gradation from the mildest to the most severe and fatal cases. Any classification, therefore, is more or less artificial, as we frequently meet with cases which with equal right might belong to either one of two different subdivisions.

Osler,² for instance, divides appendicitis into catarrhal appendicitis and ulcerative appendicitis. In the catarrhal form the entire tube, but particularly the muscular coats, is thickened, the serosa congested, with slight adhesions, the lumen probably stenosed with consecutive dilatation, and containing perhaps small fecal concretions. If cut open longitudinally the appendix rolls up in the diverse direction. In the ulcerative form he expects to find fecal concretions, strictures, and partial obliterations, with ulcerations of different degrees, leading to circumscribed abscesses, diffuse peritonitis, or retrocæcal abscesses, according to the position of the appendix and the severity and suddenness of the attack. The question of bacterial infection, the most important of all, is left out. We find occasionally the most severe forms of sepsis in cases in which

¹ Nordisk Medicinsk Archiv., 1893, Bind iii. Heft 2.

² Practice of Medicine, 1894, p. 407.

the appendix, macroscopically at least, is comparatively healthy, and in which the infection starts in the wall of the appendix and extends through a septic lymphangitis. Besides, the ulcerative forms with abscess and peritonitis, although dependent upon ulcerations, are so different in regard to etiology, pathology, symptoms, and prognosis, that it scarcely seems proper to describe them all in one division.

Prof. With's¹ classification is more appropriate, as he calls attention to the extreme importance of the affection of the peritoneum, but, on the other hand, appendicitis may be present without the peritoneum being affected and without ulceration being present. There is no place in his classification for chronic, recurrent, or infectious forms.

Hawkins² classifies his cases pathologically, in four groups:

1. Catarrhal appendicitis, marked particularly by shedding of the epithelium, and apt to pass into a chronic condition with thickening of the wall.
2. Cystic condition of appendix, due to a post-catarrhal stricture or kinking.
3. Ulcerative appendicitis due to coprolites or foreign bodies.
4. Acute infective inflammation of the wall, due to bacilli, occurring either without much change in the mucous membrane or following one of the three former ones.

Clinically³ he uses the same classification as Prof. With,—adhesive peritonitis, perityphlitis with local abscess, and perityphlitis with general peritonitis,—although

¹ Festskrifter ved Kjöbenhavns Universitet, 1879, p. 59.

² Loc. cit., p. 55.

³ Loc. cit., p. 75.

he acknowledges that there is no such absolute distinction in the natural history of the disease. There is, he says, in regard to the extent of peritoneum inflamed, every degree between an absolute general peritonitis and one involving the surface of the appendix only, and, as regards the character of the exudation, every degree between an abdomen full of pus and a trace of coagulated fibrin on the floor of the right iliac fossa.

Murphy¹ gives probably the most specific pathological classification, taking regard both to the lesions of the appendix and to their effect upon the surrounding organs and peritoneum. He divides them into seven groups:

1. Simple catarrhal appendicitis, accompanying a catarrhal enteritis and without peculiar symptoms, except slight tenderness.
2. Ulceration of mucous membrane without perforation.
 - a. Pressure atrophy with infection.
 - b. Ulceration with purulent accumulation.
 - c. Typhoid ulcer.
 - d. Tubercular ulcer.
3. Ulceration with perforation.
4. Gangrene of mucous membrane, dependent upon mechanical compression by foreign bodies, by accumulated fluid, or by infection of the wall.
 - a. Local.
 - b. General.
5. Gangrene of appendix complete, by compression of base by foreign body, by infection of the wall, or by contortion.
 - a. With perforation.
 - b. Without perforation.

¹ Journal of the American Medical Association, March, 1894, and Medical News, January 5, 1895.

6. Infection of peritoneal cavity.
 - a. Without perforation, local or general.
 - b. With perforation, local or general.
7. Peritonitis.
 - a. Local peritonitis without limiting adhesions.
 - b. Circumscribed abscess.
 - c. General peritonitis.

His subdivisions are, however, carried too far. There is no difference between an ulceration and a local gangrene of the mucous membrane, either pathologically or etiologically; nor between ulceration with perforation (No. 3) and infection of the peritoneal cavity with perforation (No. 6). Peritonitis is simply a stage in the disease, and may result from any form, even from a simple catarrhal appendicitis, or may even occur without any particular macroscopical lesion of the appendix.

Berry¹ and Kelynack² give a classification that is clinically correct, but not sufficiently comprehensive pathologically. This classification is:

- A. Simple inflammatory forms, to which belong:
 1. The non-perforating or medical appendicitis, including mild forms that yield to medical treatment.
 2. The perforating or surgical appendicitis, which always demands surgical treatment.
 3. Recurrent or chronic appendicitis, also a surgical affection.
- B. Specific inflammatory appendicitis, with its subdivisions:
 - Tuberculous appendicitis.
 - Typhoid appendicitis.
 - Actinomycotic appendicitis.

¹ Loc. cit.

² Loc. cit., p. 77.

It has no place for the more severe forms of simple appendicitis which are surgical lesions without being perforating forms, such as cystic dilatation from strictures and kinks, ulcerative forms from pressure necrosis from coprolites, infectious forms terminating in total or partial gangrene or in septic lymphangitis, all dependent upon bacteria.

I believe it more useful to classify the cases *pathologically*, into

Simple catarrhal appendicitis,

Ulcerative appendicitis,

Infectious appendicitis,

all of which may be followed by more or less severe complications, such as strictures, dilations, perforations leading to local abscesses or peritonitis, gangrene or lymphangitis, or to chronic recurring appendicitis, the severity again dependent upon a pure or mixed bacterial infection; and *clinically* into

Simple appendicitis,

Appendicitis with perforation and local circumscribed abscess,

Appendicitis with gangrene, without perforation,

Appendicitis with gangrene, perforation, and diffuse peritonitis, and

Chronic recurring appendicitis.

SIMPLE CATARRHAL APPENDICITIS.

This form is probably of frequent occurrence, although we have no means of establishing the frequency, as it usually gives no symptoms save a slight tenderness. It may subside without leaving any trace, if the cause be removed, but it is probable that it more frequently goes over into a subacute or chronic form, leaving pathological changes which favor new attacks.

The pathological changes¹ are those of any other inflammation of a mucous membrane,—shedding of the epithelium, infiltration of the submucous tissue, and formation of granulation tissue, which by cicatricial retraction may lead to partial or total obliteration, the latter being a perfect cure, and to the formation of strictures, which again are the principal cause of chronic appendicitis. Perfect recovery may occur if the process be mild and the epithelium is reproduced, or if total obliteration takes place; but more frequently, probably, the process goes on. The lumen is found filled with leucocytes and a foul, badly-smelling secretion; the swelling of the membrane near Gerlach's valve produces stagnation; the muscular coats become thickened and infiltrated, while pus is secreted from the new granulation-tissue. The microbes present multiply and become virulent, while their entrance into the wall is made easy by the destruction of the epithelium, and the more severe forms with gangrene and perforation very quickly develop,—so quickly that the acute inflammatory stage of the mucosa often may be completely overlooked.²

If neither spontaneous recovery by total obliteration nor death intervenes, strictures are apt to result. Hawkins³ believes they will form more easily at the insertion, although two or three strictures may be found at different points. Obstruction, he states, may also occur by an acute bend, in some cases the result of old adhesions, in other cases probably due to shrinking of an infiltrated mesenterium.⁴ The higher degrees of cystic dilatation often accompany such bends, as the mucous membrane is comparatively intact and continues to secrete, for a time at

¹ Hawkins, loc. cit., p. 24.

² Ibid., loc. cit., p. 27.

³ Loc. cit., p. 30.

⁴ Treves, *Lancet*, February 18, 1888, p. 332.

least, until it by the increased tension becomes atrophied, or acute attacks supervene from bacterial infection. In course of time, a permanent fibrous stricture is developed at the site of the bend in most cases, although by straightening of the tube the cystic dilatation may disappear. Treves¹ mentions such a case. I believe that perfect recovery may occur after the acute catarrhal forms, when the process recedes and the epithelium is re-established; I judge, however, from analogy with acute inflammations in other mucous membranes. There are no statistics of any value bearing on this point, and no post-mortem examinations; neither can such a mild attack be diagnosed clinically. That perfect recovery, however, may occur by total obliteration, is demonstrated.

Obliteration.—Ribbert² found obliteration of the appendix in twenty-five per cent. of four hundred autopsies, but warns against considering it always pathological, as the percentage increased with age, from four per cent. in children up to ten years, to fifty per cent. in people over sixty years of age. Ribbert, therefore, believes it to be frequently a process of involution. He found total obliteration in sixteen cases. Finkelstein³ also states that such a process is not necessarily pathological, but may be a phenomenon of involution. Kelynack⁴ in ninety-eight cases found the appendix partly obliterated, especially at its tip, in twenty-one and totally obliterated in two. Hawkins⁵ found in one hundred bodies partial obliteration in four cases and total obliteration in one case.

¹ Lancet, February 9, 1889.

² Virchow's Archiv für Pathologie, Anatomie und Physiologie, 1893, p. 132.

³ Deutsche Zeitschrift für Chirurgie, 1891, Band xxxviii.

⁴ Loc. cit., p. 21.

⁵ Loc. cit., p. 16.

Renvers's¹ examinations are more convincing. He examined by autopsy thirteen patients, all of whom previously had recovered from attacks of appendicitis, and in every case but one found complete obliteration of the entire appendix, which was buried in adhesions. The serosa of the cæcum was thickened, the cæcum adherent instead of being freely movable. The appendix, buried in firm adhesions, was lying close to the cæcum and could be recognized only by dissection. In one case he found a coprolite surrounded by fibrinous tissue. Fenger² considers it likely that partial or total obliteration may occur as the result of a mild attack.

Senn³ mentions appendicitis obliterans as a quite frequent form and as characterized by progressive obliteration of the appendix. The process, he states, commences either as ulceration in the mucous membrane or as an interstitial inflammation with destruction of the epithelium and the glands and formation of cicatricial tissue. While perfect obliteration may occur, it takes a long time, and danger is present meanwhile, as relapses take place with short intervals. He, therefore, considers operation to be indicated and has performed it in four cases.

Perfect obliteration seems, however, according to the previous statistics, not to be of frequent occurrence, and, at least, much less frequent than partial obliteration. This form, however, does not constitute a cure, but is (unless it happens to be in the tip) just as dangerous as a stricture, or rather more so, as it necessarily is followed by cystic development from stagnation of the secretion.

¹ Zur Pathol. und Therap. der Perityphlitis, Deutsche Med. Wochenschrift, 1891, No. 5.

² American Journal of Obstetrics, 1893, vol. xxviii., No. 2.

³ Journal of the American Medical Association, March 24, 1894.

Morton¹ reports an operation on a man who for eight years had had repeated attacks of pain. The appendix was found obliterated in the inner third, while the two other thirds were dilated and contained a concretion one and a half inches long and an eighth of an inch in diameter.

ULCERATIVE APPENDICITIS.

There is a perfect gradation from the catarrhal forms through cystic dilatation to the ulcerative forms. The cystic dilatation is the result of retained secretion on account of stricture, and the stricture again is the result of a preceding catarrhal appendicitis. These cystic dilatations change readily into empyema, on account of the growth and increased virulence of the microbes in the retained secretion. Their size depends upon the place of the stricture, their termination on the virulence of the microbes. That ulcerations form wherever we have pus enclosed in a sac is evident, and needs no demonstration. In my own statistics of seventy-five cases, I find in forty-two cases (*i.e.*, fifty-six per cent.) cystic dilatation, strictures, or bends as etiological factors, there being fifteen cases of cystic dilatation, twenty-two of strictures, and five of bends. Prof. Dieufaloy² considers cystic dilatation almost the rule, stating that in all cases of appendicitis there is partial obliteration of the appendicular canal, and that the appendix is converted into a closed cavity, either on account of a calculus, or from local infection, or from the formation of a stricture.

It is, however, a question whether mechanical obstruction alone is sufficient to produce ulceration, as White³ and others have stated. Hawkins⁴ thinks that this form

¹ Annals of Surgery, September, 1896, p. 380.

² Loc. cit.

³ Loc. cit.

⁴ Loc. cit., p. 33.

depends upon a primary local ulceration due to the presence of a fecal concretion or foreign body, and not preceded by a general catarrh. I have no doubt that a sharp foreign body may produce ulceration by direct traumatism, and I have seen a few specimens in which perforation has occurred from foreign bodies. Fecal concretions, however, do not commence to increase in size until there is obstruction of the canal. In other words, the obstruction leads to the formation of fecal concretions, and a catarrhal condition precedes the obstruction in all cases. When the concrement increases in size and hardness by new deposits, atrophy may occur as a first result, followed later by necrosis from pressure, aided by muscular contractions to expel the concrement. The ulceration, however, is of particular importance as a gate of entrance of the microbes to the deeper tissues. The result is inflammation and suppuration with œdematous swelling, which may reach such a degree that the circulation is cut off and total gangrene occurs. In the majority of cases, however, the necrosis is localized, leading to perforation of the serosa, followed by either local or diffuse peritonitis. If the process is slow, a localized adhesive peritonitis has time to develop before perforation occurs. Exudation and agglutination of coils of intestine occur around the appendix, producing the usually-felt tumor, and a local abscess forms, shut off from the peritoneal cavity by newly formed adhesions.

This abscess is primarily intraperitoneal, and may, according to Finkelstein,¹ be found in one of four different places: (1) anteriorly and outward, the cæcum forming the posterior wall and agglutinated coils of intestines the inner wall; the parietal layer of the peritoneum forms the

¹ Deutsche Zeitschrift für Chirurgie, 1891, Band xxxviii. p. 211.

anterior wall when the abscess has become large. (2) Backward, with the posterior surface of the cæcum forming the anterior wall. This happens particularly in those cases in which the appendix lies wholly or partly behind the cæcum, or in which a septic lymphangitis (to be mentioned later) extends backward between the two layers of the mesenterium. The fascia transversalis limits the abscess anteriorly; the fascia iliaca, behind; upward it may extend behind the kidney, or even up to the liver, and produce a perinephritic or a subphrenic abscess. Downward it may, in rare cases, extend along the iliac vessels and appear on the anterior or inner surface of the femur, or perforate outward above the outer third of Poupart's ligament, or secondarily into the peritoneal cavity. (3) Inward, with the inner surface of the colon and cæcum as its external wall, the mesocolon as its posterior wall, and agglutinated coils of intestines forming its inner and lower wall. I consider this the most serious form and most difficult to operate upon without infecting the peritoneal cavity. (4) Downward into the pelvic cavity, with agglutinated coils as roof. All these abscesses may perhaps in rare cases be reabsorbed spontaneously, but the usual course is gradual enlargement, and in favorable cases perforation into the cæcum, rectum, intestines, or bladder, resulting finally in a cure. The great danger is, however, secondary perforation into the abdominal cavity, producing diffuse peritonitis.

The appendix has now and then been found in inguinal and femoral ruptures on the right side. Both the appendix and the cæcum have been found in such cases very movable, on account of large mesenteriola. A regular appendicitis may develop in such cases, with symptoms more indicative of hernia than of appendicitis. Dr. Lud-

wig Kraft¹ examined the histories of five hundred and eighty-three cases of herniotomy from the Commune Hospital in Copenhagen. The appendix and ileum were found three times, the appendix and cæcum once, and the appendix alone four times. The appendix was present, therefore, in one and four-tenths per cent.

INFECTIOUS APPENDICITIS.

While the ulcerative form of appendicitis generally has as predisposing cause a mechanical obstruction or fecal concrement, and perhaps may progress in rare cases to perforation without bacterial infection, the infectious form, on the other hand, depends upon bacterial infection as an exciting cause. It may start very suddenly, with violent pain and rapid fatal peritonitis, and, nevertheless, no necrosis and no perforation be visible to the naked eye,² or it may result from either the catarrhal or the ulcerative form and speedily lead to necrosis and perforation. We find all kinds and degrees of inflammation, from a simple catarrhal form, perhaps with loss of the epithelium only, to total gangrene of the whole appendix; but the mucous membrane may be intact and the inflammation start in the deeper tissues of the wall, producing necrosis of the submucous and muscular coats, or suppuration, or, lastly, infiltration and exudation.³ All three forms are alike followed by virulent peritonitis, and bacteria are found in the muscular and submucous coats in them all, as well as in the peritoneal exudate around the diseased appendix, even if there is no perforation of the wall. The very fact that the inflammation may start in the wall is sug-

¹ Appendix vermicularis i Brok, see Nordisk Medicinsk Arkiv, 1894, Heft 4.

² Hawkins, loc. cit., p. 39.

³ Ibid., loc. cit., p. 45.

gestive of the action of some agent which has penetrated from without; violent inflammations besides, leading to necrosis or gangrene, are invariably of bacterial origin.

Hawkins¹ thinks that the necrosis results from the direct action of the bacilli or their toxins upon the tissues, or from strangulation of the capillaries, analogous to sloughing of the skin from a tense œdema. Wyeth² thinks it due more to disturbance of the circulation from pressure or hyperdistention, as the process may go on so rapidly that total gangrene may be present in twelve hours and before adhesions have time to form. Fowler³ thinks it possible that an endarteritis or phlebitis may be the leading factor, particularly as there is but one artery. He found in one case a stasis thrombosis of septic origin. The gangrene, however, is always of the moist variety, and this would speak more for the interference with the vein than with the artery.

It has been mentioned that cases of diffuse peritonitis may occur without appreciable macroscopical lesion of the appendix, and even that death may occur before peritonitis has had time to develop. These cases have given occasion to a good deal of discussion. Lennander⁴ lays a good deal of stress on the lymphatic vessels, as formerly Iversen⁵ had done. The swelling of the mucous membrane and the increased secretion may produce a complete stenosis of the appendix in acute attacks, and the lymphatics may then offer the only chance of removal of inflammatory products. The lymphatics follow the vasa ileocolica, along which numerous lymphatic glands normally are found. Lennander found these glands

¹ Loc. cit., p. 55.

² Loc. cit.

³ *Annals of Surgery*, January, 1894, p. 19.

⁴ Loc. cit., p. 21.

⁵ *Forhandlinger of Kjöbenhavns Med. Selskab*, 20 Januar., 1891.

swollen in five cases of chronic appendicitis, and he considers it probable that acute lymphadenitis and lymphangitis also occur in the acute forms. Such a condition would account for the somnolence, profuse perspiration, and general malaise which often precede the attack and which may result from toxine-poisoning through the lymphatics. In the same way, he thinks, we may explain those rare cases which begin with severe pain, meteorism, collapse, and all the symptoms of an acute appendicitis, and in which we by operation find neither peritonitis nor affection of the appendix serious enough to explain the condition. I have met at least two such cases. (No. 51 and No. 52.) We may in such cases during early operation find nothing to explain the condition, while if we wait septic peritonitis may take place.

Lennander calls attention to another point of interest. Chronic appendicitis, he states, may probably occasion chronic lymphadenitis, and this may continue for a time after the removal of the appendix, so that perfect recovery may not take place immediately. Willy Meyer¹ also mentions a case as proof that acute sepsis with general peritonitis may set in without any macroscopical lesion of the appendix, although all clinical symptoms of perforation are present. My case No. 52 is a similar one. Prof. Dieulafoy² states that the virulence of the infection may suffice to kill the patient while the peritoneal symptoms are quite subsidiary, and that the infection may spread to the peritoneum despite the absence of any perforation of the appendix, and any variety of peritonitis may be developed. Fenger³ mentions particularly one

¹ Medical Record, February 29, 1896.

² Report of the Academy of Medicine, Paris, March 10, 1896.

³ American Journal of Obstetrics, 1893, vol. xxviii., No. 2.

case of septic lymphangitis in which he found diffused islands of leucocytes or miliary microscopic abscesses in the subserosa. He believes the lymphangitis and diffuse inflammation more pronounced in the subperitoneal tissue than in the muscular coat, and that plastic peritonitis, therefore, is an almost constant consequence and accounts for the adhesions in which the appendix afterwards is found buried. Murphy¹ mentions infection of the peritoneum through the wall of the appendix or along its mesentery, with general peritonitis, without perforation. Hawkins² considers it possible for a patient to die from infective appendicitis before necrosis of the wall has occurred, and that, on the other hand, in a case of general peritonitis the appendix may be examined during an explorative laparotomy and acquitted, while it, nevertheless, is the cause of the mischief. Such a septic lymphangitis and lymphadenitis may give rise to a primary retroperitoneal abscess, the inflammation spreading between the two layers of the mesentery backward, particularly in cases in which the mesentery covers the appendix out to the tip. Kórté³ mentions this extension between the layers of the mesentery and has demonstrated it experimentally. Through a canula introduced into the mesentery of the appendix he was able to force colored fluid between the two layers of the mesentery into the retroperitoneal tissue and up behind the liver.

Ferguson's⁴ and Turner's⁵ examinations showed that the appendix in relatively thirty-eight and twenty-six per

¹ Journal of the American Medical Association, March, 1894.

² Loc. cit., pp. 39 and 68.

³ Ueber Chirurgische Behandlung des Perityphlitis, Berliner Klin. Wochenschrift, 1891, pp. 26 and 27.

⁴ American Journal of the Medical Sciences, 1891.

⁵ Quoted by Fowler, Annals of Surgery, May, 1894.

cent. lies behind the cæcum and in intimate connection with the retroperitoneal tissue. In such cases the inflammation will necessarily be in the line of a primary phlegmon in the subperitoneal tissue; otherwise, all other abscesses are, primarily at least, intraperitoneal.

THE PERITONEAL LESIONS.

There is no appendicitis without more or less peri-appendicitis, which is simply another word for peritonitis; we may probably even go one step farther, and state that it is the affection of the peritoneum that produces the pain and swelling and makes the diagnosis clear. Talamon¹ distinguishes three forms, under which all forms may be classified: (1) fibrinoplastic peritonitis, or simple adhesive peritonitis; (2) fibrinopurulent peritonitis, the usual circumscribed perityphlitic abscess; and (3) sero-purulent or serosanguinolent peritonitis, also called septic or acute diffuse peritonitis.

Fibrinoplastic or Adhesive Peritonitis.—This variety is found in the simple catarrhal or cystic forms, and may be regarded more as a beneficial process of nature than as a disease. Talamon² rightly compares it to the fibrinous pleurisy which takes place in contact with a focus of pneumonia. It may at the end of from thirty-six to forty-eight hours be sufficiently marked to produce adhesions between the appendix and the neighboring parts and to glue together coils of intestines.

Suppuration does not take place unless perforation of the appendix occurs; nevertheless, the colon bacillus has been found in the exudate. I have already stated that Bristow³ got a pure culture from fresh exudations of lymph from the outer side of the appendix, as well as from the

¹ Loc. cit., p. 53.

² Loc. cit., p. 53.

³ Loc. cit.

wall itself, or from peritoneal exudations and abscesses; and also that Ziegler's¹ experiments showed that a moderate amount of a pure culture of the colon bacillus injected into the peritoneal cavity would produce localized peritonitis only. I believe, therefore, that it is the same process and dependent upon the same cause, the colon bacillus, as in the more severe forms, but that the bacillus is present in small numbers and that the exciting cause, the simple catarrh or cystic degeneration, is less apt to produce ulcerations. Hawkins² in twenty-five such cases found chronic catarrh in fourteen, a cystic condition in seven, and a coprolite without ulceration in four. The exudation generally becomes absorbed again: it may, however, form adhesions and lead to obstruction. It may perhaps also lead to a circumscribed abscess, if pyogenic microbes perforate the wall of the appendix without causing ulceration.

Obstruction has usually been found dependent upon adhesions of the appendix to the neighboring parts, forming a loop, through which some portion of the intestines, generally the lower end of the ileum, has been strangulated. Kelynack³ mentions a number of such cases from different authors. I have met with two cases. (See Nos. 69 and 75.) Obstruction, however, is more apt to form after the suppurative cases. Lange⁴ operated on one patient, twenty-two years of age, for ileus, four weeks after extensive suppurative peritonitis from appendicitis. He had formerly had six similar cases, of which three recovered. In the case mentioned a thick, vascular band, constricting the ileum, extended from the mesentery to the mesocolon ascendens. He emphasizes the importance

¹ Loc. cit., p. 29.

² Loc. cit., p. 61.

³ Loc. cit., p. 49.

⁴ Annals of Surgery, September, 1886, p. 376.

of a timely operation. McBurney¹ reports a case of volvulus occurring ten days after operation for appendicitis, with gangrene and perforation, and dependent upon adhesions of a coil of the ileum, producing a half-twist. The patient recovered by operation with loosening of the adhesions. In my case (No. 75) the sigmoid flexure was strongly adherent in the right ileocæcal region. The patient recovered by laparotomy with loosening of all the adhesions.

Fibrinopurulent Peritonitis, or Circumscribed Abscess.

—This form of peritonitis belongs particularly to ulcerative appendicitis, and depends upon the presence of a fecal concretion, although it may follow a simple acute or chronic catarrh or a cystic dilatation, provided ulceration of the wall takes place from some cause or another, so that bacteria may enter the wall. Hawkins² in twenty-seven cases found ten due to chronic catarrh with necrosis of the wall, fifteen to ulceration from a concretion, one to chronic catarrh without necrosis, and one to cystic dilatation. The abscess, as already mentioned, may be found in different places, according to the position of the appendix. It is always primarily intraperitoneal except in the cases in which the appendix is found wholly or partly behind the cæcum or in which the abscess depends upon a septic lymphangitis and starts in the retroperitoneal tissue. It may perforate into the different abdominal organs, cæcum, rectum, ileum, bladder, etc., or through the abdominal wall or into the vagina. The most dangerous eventuality, however, is perforation into the abdominal cavity.

The pus is rarely pus bonum et laudabile. More frequently we find a seropurulent or serofecal, stinking

¹ Medical Record, July 25, 1896.

² Loc. cit., p. 60.

fluid, mixed with fibrinous membranes and gangrenous particles, besides fecal matter, coprolites, and air. This depends upon whether or not there is a stricture of the appendix present on its proximal side. In the latter case we have a direct communication between the intestines and the abscess.

The size of the abscess depends upon the duration of the disease. I have in one case, in which the abscess was retrocæcal and had been overlooked four weeks, seen it occupy the whole retroperitoneal tissue behind the kidney and up to the liver, and contain over one quart of pus. It may be divided into different parts extending in different directions. In one case I found a perfect hourglass-shaped abscess, one half intraperitoneal and containing a fecal concrement, the other half retroperitoneal. The omentum in the neighborhood is often thickened, infiltrated, and adherent, forming some part of the wall. The veins may be affected by septic phlebitis and fatal pylephlebitis may result, or the septic phlebitis may start in the veins of the mesentery.

Seropurulent or Serosanguinolent Peritonitis; Septic Diffuse Peritonitis.—This is the most important form, on account of its acute onset and its almost invariably fatal termination unless operated on very early. It may result from any form of appendicitis, but it often starts as a first attack in apparently healthy appendices.¹ Of my thirty-three cases eighteen had never had a previous attack; nevertheless, in twenty-three cases the causal element was found to be coprolites fifteen times and cystic dilatation eight times, numbers sufficient to show that pathological processes had been going on in these cases although they had given no appreciable symptoms. Hawkins² in twenty-

¹ Talamon, loc. cit., p. 56.

² Loc. cit., p. 58.

seven fatal cases found coprolites eleven times and cystic formations three times. It may, nevertheless, start without any ulceration in the mucous membrane, from either concretion or cystic dilatation, the inflammation in these cases being due to bacterial infection of the wall, probably preceded by an acute catarrh, and usually running a very acute course through septic lymphangitis.

Kelynack¹ distinguishes two pathological stages, gangrenous appendicitis and perforative appendicitis. During the gangrenous stage the wall is undergoing more or less necrosis, or it may even be totally gangrenous but yet without perforation. Kelynack thinks it may last from one to three days, but occasionally longer, and that it is characterized by very severe pains in the right iliac region. Thirteen of my cases were of this form, with more or less total gangrene but without perforation. They all recovered by early operation, and form, in my opinion, by all odds the most important part of the statistics as proving the extreme value of early operation. In those cases with very diffuse pains in the beginning, we often meet a serous or serofibrinous exudation on opening the abdominal cavity. Roux² mentions the same exudation into the peritoneum in cases of circumscribed intraperitoneal abscesses, and considers it simply symptomatic of the healthy peritoneum's reaction to an incapsulated abscess. It recedes if the abscess is opened or the gangrenous appendix extirpated, but forms an excellent medium for propagation and spreading of microbes if perforation occurs. The perforative stage is characterized by intense pain, sudden onset, and symptoms of diffuse peritonitis.

¹ Loc. cit., p. 93.

² Du traitement chirurgical de la péritiphylite suppurée, *Revue Médicale de la Suisse Romande*, September 20, 1891.

The peritonitis may result either from primary perforation of a gangrenous appendix or from secondary perforation of a local, circumscribed abscess. To show the relative frequency of perforation from appendicitis compared with perforation from other causes, Finkelstein¹ mentions Bouness's report of fifty-nine cases of peritonitis from perforation, of which sixteen were from typhoid fever, eleven from appendicitis, nine from ulcer of the stomach, and seven from tubercular ulcers of the stomach, and Grawitz's report of five hundred and sixty cases, also showing that next after perforation from typhoid ulcers perforation from appendicitis is most frequent. Kelynack² thinks the primary perforation most frequent. Finkelstein, Kammerer, and others consider the secondary the most common, as most cases are chronic and give time for the formation of adhesions. I agree perfectly with Kelynack, as of my twenty cases of gangrene with perforation and diffuse peritonitis only one case was the result of secondary perforation of a circumscribed abscess, but I operate on my patients early and do not wait for a large abscess to form.

That the secondary perforations, as Finkelstein states, are the most malignant, because a large amount of infectious material is suddenly introduced into the peritoneal cavity, we may also agree to. The degree of peritoneal inflammation is proportionate to the infection, and depends probably upon the size of the perforation and the amount and virulence of the material introduced into the peritoneal cavity. The amount is often very small when a stricture is present on the proximal side of the perforation. If the amount is large the patient may die in less than twenty-four hours of shock or peritoneal sepsis, and we

¹ Loc. cit., p. 220.

² Loc. cit., p. 93.

may find but a small amount of serosanguinolent fluid, or it may even be absent, as it has no time to develop.

As a rule, we find agglutinations of the intensely congested intestines with false membranes, infiltrated with pus, and a turbid fluid with fibrinous flakes. If direct communication with the cæcum is present, the exudation may have a fetid, stinking odor, and be sometimes mixed with gas and fecal particles. The colon bacillus is always present.¹ Walthard² concludes, from his experiments with purulent peritonitis, that it never occurs after an aseptic laparotomy, and that it is always due to infection with microbes. Mikulicz³ mentions as special forms of appendicitis the acute septic peritonitis without exudation and with slight infection of the apparently normal peritoneum, the subacute peritonitis with dry, fibrinous adhesions but also without exudation, and the diffuse peritonitis with seropurulent or serofecal exudation according as we find perforation without or with free communication with the cæcum.

Fenger⁴ considers the dry forms absolutely fatal; Morris⁵ thinks that even they may occasionally recover by loosening of all adhesions and through disinfection. Mikulicz⁶ mentions another special form, which he calls progressive fibropurulent peritonitis, in the beginning limited to the surroundings of the perforation, but later having limited pus foci between the agglutinated bowels. Every intraperitoneal pus focus must be opened by itself, and laparotomy is not indicated. He incised in one case

¹ Talamon, loc. cit., p. 56.

² Deutsche Med. Zeitung.

³ Archiv für Klin. Chirurgie, 1889, Band xxxix. p. 756.

⁴ American Journal of Obstetrics, 1893, vol. xxviii., No. 2, p. 15.

⁵ Lectures on Appendicitis, New York, 1895, p. 63.

⁶ Annals of Surgery, 1889.

six intraperitoneal abscesses at different times when fluctuation occurred; in another case three abscesses in the same way. Mikulicz thinks also that certain anatomical conditions help to localize these abscesses and prevent the diffuse peritonitis.

The transverse colon and the large omentum divide the peritoneal cavity into a supraomental space and an infraomental space. The infraomental space is again divided by the mesenterium of the jejunum and ileum into a supramesenteric portion and an inframesenteric portion. The supraomental space is divided by the liver into the subphrenic and the infrahepatic space. All barriers extend transversely, and oppose, therefore, extension of a suppuration in the vertical line upward, while pus may flow downward on account of its own gravity. On the lateral side of the ascending and descending colon there are no barriers to prevent the extension of a suppuration upward in a vertical line.

I believe the form of peritonitis generally depends upon whether there is a large perforation communicating freely with the cæcum, or simply a small perforation on the distal side of a stricture. In the first case we shall always, when adhesions are absent or insufficient, meet a rapidly fatal, diffuse peritonitis; in the second, a more slowly progressing and more favorable fibropurulent peritonitis. The secondary perforations are rarely seen in our days, at least in America, where we operate before such an eventuality can occur.

I have not mentioned **chronic recurring appendicitis** as a special pathological form, because I look upon it simply as a result of the catarrhal or (rarely) of the ulcerative forms, dependent upon strictures, cystic dilations, kinks and adhesions, and now and then coprolites. Clinically, however, it is of great importance, as it may

keep a patient in a state of chronic invalidism, although there is no great tendency to perforation. The question of the percentages of recurrence is, however, of interest. Fitz¹ in two hundred and fifty-seven cases had recurrence twenty-eight times,—*i.e.*, eleven per cent.; Krafft in one hundred and six cases had recurrence twenty-four times,—twenty-two per cent.; Hawkins² in two hundred and fifty cases had recurrence fifty-nine times,—twenty-three and six-tenths per cent. Of my seventy-five cases thirty-five had had previous attacks,—*i.e.*, forty-seven per cent.,—and of these thirty-five cases eight had had one previous attack, six had had two attacks, nine had had three, five had had four, and seven had had many.

Another question of interest is the time when the second attack occurred. Albert Wood,³ in order to determine the probable risk to life insurance companies from this class of patients, examined three hundred and twenty-six cases. Of these two hundred and ten cases had had a second attack before six months, sixty cases had second attack between six months and one year, fourteen cases had second attack between one year and eighteen months, fifteen cases had second attack between eighteen months and two years, eleven cases had second attack between two and three years, three cases had second attack between three and four years, thirteen cases had second attack after five years.

In other words, fourteen per cent. of second attacks occurred within half a year, eighty-two and eight-tenths per cent. within one year, eighty-seven and one-tenth per cent. within eighteen months, ninety-one and one-tenth per cent. within two years, ninety-four and four-tenths per cent. within three years, ninety-four and nine-

¹ Loc. cit.

² Loc. cit., p. 112.

³ Medical Record, August 22, 1895.

tenths per cent. within four years, and ninety-six and five-tenths per cent. within five years. We may, therefore, say that the large majority of second attacks occur before the end of two years, and that after that time recurrence will occur in only about nine per cent.

The typhoid and tubercular lesions in the appendix offer nothing to distinguish them pathologically from similar lesions in other parts of the bowels. The frequency with which we meet them has already been mentioned under the etiology. *Actinomycosis* has been observed in too few cases to be of any great importance; it seems, however, to have produced abscesses in the ileocæcal region, which had some of the symptoms of an appendicitis, particularly a large iliac or retrocæcal abscess.

NEW GROWTHS OF APPENDIX.

Primary growths are practically unknown. In an examination of fifteen thousand four hundred and eighty-seven neoplasms from different London hospitals, Mr. Williams could find no mention of any neoplasm involving the appendix primarily.¹ Glacerbrook,² however, mentions a case of endothelial sarcoma limited to the appendix; Morris³ mentions another. The infiltration in relapsing appendicitis can be so hard as to simulate a neoplasm in the right iliac region. Gerster mentions such a case. I have seen and operated on a similar one. (See Case No. 56.)

SYMPTOMATOLOGY.

We meet frequently more or less strongly-marked prodromata. These consist of slight gastro-intestinal symptoms, eructations, light diarrhœa, succeeded by constipation and sudden light colicky pains, particularly

¹ Kelynack, loc. cit., p. 139.

² Virginia Medical Monthly, 1895.

³ Lectures on Appendicitis, 1895.

around the navel. We find these symptoms still more frequently in patients who already have had one or more acute attacks. An acute attack may, nevertheless, occur without prodromata, in formerly healthy individuals, and commences then, as a rule, with severe pain in the abdomen. This is often considered simply an attack of colic and treated with physic, with the result that the symptoms quickly grow worse on account of the irritation from the increased peristaltic motions. Vomiting occurs a few times, the patient complains of more or less fever, and the pains soon become fixed in the right ileocæcal region, with considerable tenderness to palpation. An indistinct, deep-seated hardness is often felt after twenty-four hours. This may end the attack and all the symptoms may gradually disappear. This is the clinical picture of a common mild attack of adhesive peritonitis from appendicitis.

In other cases the symptoms are more severe. The fever is higher, continuous, often remittent, with evening exacerbations, but the pulse does not go much above 100. The pain is more severe; the right leg is occasionally flexed; rigidity of the muscles in the right ileocæcal region occurs, followed by a swelling, becoming more and more distinct as days pass by. The whole course of the disease is more acute and the patient seriously ill. This picture represents the formation of a perityphlitic abscess. In the most severe cases the pain is intense, rigidity of the abdominal muscles on both sides occurs, the abdomen becomes tympanitic, vomiting returns and often becomes continuous. The vomit is at first greenish, later fecal. The temperature often falls below normal, while, on the other hand, it may be unusually high: the pulse increases in frequency, respiration becomes costal, and the patient dies in a few days from diffuse peritonitis.

Just as there is in the pathology a perfect gradation from the simple catarrhal through the ulcerative to the infectious appendicitis, so is there a perfect gradation clinically from the simple adhesive peritonitis through a perityphlitic abscess to diffuse peritonitis. "Up to a certain point there is no feature in the symptoms which may enable us to distinguish between a suppurative and a non-suppurative case, and the physical signs in the abdomen are the same. Whether the onset is sudden and severe or gradual and mild, no man can foretell in the first twenty-four hours whether resolution or suppuration, local or diffuse, will be the outcome."¹ "The attack should be closely studied in the course of twenty-four hours, and a careful estimate of the probable behavior of the case should, if possible, be made. In the mildest cases the symptoms will be diminishing or at a standstill; the more marked will be a little worse; in others it is evident that perforation has already occurred. Of a number of cases, all beginning in a somewhat similar manner and all treated conservatively, at the end of a week some will have died of diffuse peritonitis, some will be on the road to recovery, and others again will be waiting for the surgeon to open the abscess, running the risk from hour to hour of serious accidents."²

The cardinal symptoms in all forms are pain, tenderness to pressure, rigidity of abdominal muscles, vomiting, fever, and more or less severe symptoms of peritonitis.

PAIN.

The pain is by no means limited to the ileocæcal region. It is often referred first to the umbilical region or to the epigastrium or hypogastrium. The umbilical pain seems

¹ Hawkins, loc. cit., p. 85.

² McBurney in *Annals of Surgery*, April, 1891, p. 229.

to be dependent upon direct irritation of the appendix. Fowler¹ saw the same pain produced around the umbilicus by compressing the appendix with Dupuytren's enterotome in a case of artificial anus. Bacon, of New Haven, had a patient complain of severe umbilical pain as he under local anæsthesia compressed the appendix with an artery-forceps in order to amputate it. I have often noticed similar severe umbilical pains produced by the first change of dressing after laparotomy for appendicitis, where drainage has been necessary. The patients complain when the gauze tampon, which is strongly adherent to the stump, is removed. Fitz² found the pain in forty-eight per cent. of two hundred and thirteen cases in the right iliac region, in thirty-six per cent. over the whole abdomen, in five per cent. in the hypogastrium, in four per cent. in the umbilical region, in two per cent. in the epigastrium, and in one per cent. relatively in the stomach, the hepatic region, or the left iliac fossa. In many instances pain is referred to the right testicle, which is sometimes found retracted.³

The sudden pain is presumably due, not to the actual beginning of the disease, but to the perforation of the appendix, and the more severe the pain the more probable is perforation. Fitz in sixty-one cases found perforation on the first day in forty-one cases,—*i.e.*, sixty-seven per cent.; on the second day in five cases,—*i.e.*, eight per cent.; on the third day in twelve cases,—*i.e.*, twenty per cent.; on the fourth day in two cases,—*i.e.*, three per cent.; and on the fifth day in one case,—*i.e.*, two per cent. Sudden severe pain occurred in eighty-four per

¹ *Annals of Surgery*, February, 1894, p. 148.

² *American Journal of the Medical Sciences*, October, 1886.

³ Kelynack, *loc. cit.*, p. 144.

cent., in a few cases following diarrhœa, but in most cases in apparently healthy individuals.

The pain in adhesive peritonitis may be dull and aching, either slight or so very severe that the patient may be bathed in perspiration and grow faint.¹

TENDERNESS TO PRESSURE.

This is quite different from the acute pain, which, as we have seen, indicates perforation, and is accompanied with high fever, vomiting, and at the end of twenty-four hours with beginning meteorism and symptoms of severe illness. The tenderness to pressure is a sign of value in early forms and in the chronic forms.

McBurney² has pointed out that the most severe tenderness to pressure is found in the middle of the line from the anterior superior iliac spine to the umbilicus. This point (the so-called McBurney's point) corresponds approximately to the insertion of the appendix into the cæcum. Deep pressure with one finger at this point will, therefore, usually be painful. The symptom is, nevertheless, not constant. It may be absent if the appendix is totally gangrenous or in the case of a long appendix extending down into the pelvis and inflamed at the tip while the inner part near the cæcum is healthy. In such a case the most severe pains will be elicited by rectal or vaginal examination. McBurney³ states that no other acute disease presents this symptom, and that it may be clearly made out from the first hour of the disease up to the end of several days. I have always found it present during the first few days, but other American surgeons

¹ Hawkins, *loc. cit.*, p. 77.

² New York Medical Journal, December 21, 1889, p. 678.

³ Annals of Surgery, April, 1891, p. 236.

do not give it so much importance. Hawkins¹ found it present in all cases of adhesive peritonitis from appendicitis, but it was not marked in cases of general peritonitis and may be found in some other abdominal conditions, such as pelvic peritonitis in females.

VOMITING.

Vomiting and nausea occur coincident with or shortly after the pain, and are proportionate to the extent of the peritoneum involved; nevertheless, they may be violent and continuous in a local adhesive form and trifling in a general peritonitis.² In the milder forms the vomiting generally ceases after the stomach is emptied, but returns later if perforation occurs with development of diffuse peritonitis. It is then first of the usual greenish color, but, as intestinal paresis develops with increasing meteorism, it becomes feculent and continuous. The well-known peritoneal thirst forces the patient to drink continuously, although the fluid is vomited up as quickly as swallowed.

CONSTIPATION.

Constipation may precede or accompany the attack, unless a purgative has been used. Occasionally we see more or less diarrhœa through the whole course. Hawkins³ found this in six out of one hundred and ninety cases. A persistent constipation in the beginning points towards a serious attack and is often the precursor of a regular ileus. Constipation depends upon paralysis of the affected part of the bowel. If this is limited, and the tumor small, borborygmus may occasionally be seen above, particularly during resolution. Lennander⁴ points

¹ Loc. cit., p. 79.

² Hawkins, loc. cit., p. 77.

³ Loc. cit., p. 78.

⁴ Loc. cit., p. 24.

out that ileus may occur without diffuse peritonitis and depend upon a simple local adhesive form, which produces mechanical obstruction by adhesions or kinking or organized exudations forming a band. I have met two such cases. (Nos. 69 and 75.)

RIGIDITY.

Rigidity of the abdominal muscles, both the rectus and the oblique muscles, is a symptom which we always meet when the inflammation has approached the anterior abdominal wall and the parietal peritoneum becomes involved by adhesions to the bowels, the omentum, and the mesenterium. The muscles act as sentinels, so to speak, and may be felt as hard as a board. Rigidity may, however, be absent in very early cases or in cases in which the position of the appendix is behind the cæcum or down in the pelvis. Tenderness is, however, present. The rigidity is present on the right side alone as long as the peritonitis is localized, but occurs on both sides as soon as the peritonitis becomes universal by the perforation of a gangrenous appendicitis or of a local abscess. This is, therefore, an ominous symptom.

TUMOR.

Muscular rigidity may continue as long as acute symptoms are present, but it generally lasts only a few days, and a tumor or a resistant mass may usually then be felt, fairly hard and well defined upward and inward, with the long axis above and parallel with the outer part of Poupart's ligament, but otherwise variable in size and shape. Hawkins¹ thinks it depends upon congestion, œdema, and swelling of the wall of the cæcum and of the ileum in the

¹ Loc. cit., p. 87.

iliac region, the interstices between the coils containing coagulated fibrinous exudation and producing fixation of the cæcum and adjacent coils. Hawkins considers this fixation the principal cause of the hardness, although the thickened omentum may play a *rôle* too. I consider it improbable that fecal accumulations in the cæcum have anything to do with the hardness, as in sixty-nine laparotomies I found the cæcum empty in every case.

Sahli¹ does not believe that the tumor ever depends upon fecal accumulations or upon serofibrinous exudations. In many cases, he believes, it is formed by the increasing amount of pus; in others, particularly where the disease disappears spontaneously, without perforation of an abscess, it depends upon thickening and infiltration of the wall of the cæcum and the appendix, and of the visceral and parietal layer of the peritoneum; in some cases, upon infiltration of the fascia transversa and the abdominal muscles; and, lastly, upon the thickened omentum. Roux² mentions such a case of thickening of the fascia and omentum. The primary cause of the tumor, Sahli believes, is the enlargement of the inflammatory focus in the appendix,—*i.e.*, the empyema. Pus is always present in every kind of tumor. Sahli explains the spontaneous recovery of so many cases, although pus is present in them all, in the following way: in the lighter forms, only small amounts of pus will be found; it may become reabsorbed, or it may probably in numerous cases perforate into the cæcum, through the natural but narrowed opening, and not through the wall.

Fitz³ rarely saw the tumor before the third day, but

¹ Ueber die Pathologie und Therapie der Typhlitiden, Verhandlungen des 13 Congresses für Innere Medicine in München, 1895, p. 204.

² Loc. cit.

³ Loc. cit., p. 342.

thinks it is sure to form if the patient lives long enough. The swelling may be found primarily in the retrocæcal tissue in cases in which the appendix is retrocæcal. Kelynack¹ and Talamon² are more or less sceptical in regard to the appearance of a tumor until later in the disease, and believe that the muscular rigidity will prevent all deep exploration. It depends, however, upon how the exploration is carried out. If done gently and with the whole hand, we may explore quite well without producing increased rigidity or severe pain. The rigidity disappears, besides, under anæsthesia, and a resistance or tumor will then, according to my experience, always be found as early as the second day, save in cases in which the appendix extends far down into the pelvis or is retrocæcal, or in cases of primary diffuse peritonitis, in which nature makes no attempt towards limiting the inflammation by exudations and adhesions.

TYMPANITES.

Tympanites may in the beginning be partial, limited to the immediate surroundings of the cæcum, where it may produce a local protrusion resembling an abscess. The tympanites increases quickly in the diffuse peritonitis, with rigid and hard walls and complete paralysis of the intestinal canal. Distention may, however, occur without diffuse peritonitis being present, from adhesive bands or from obstinate constipation, often during opium treatment. Richardson³ distinguishes between the two conditions with the stethoscope, nothing being heard if diffuse peritonitis is present, while the peristaltic action produces gurgling sounds if the distention is due to accumulation of gas without peritonitis.

¹ Loc. cit., p. 145.

² Loc. cit., p. 89.

³ Loc. cit.

PERCUSSION.

By gentle percussion a certain amount of dulness may often be detected, unless the swelling is very deep-seated. The dulness increases usually as the abscess grows larger and becomes more superficial, pressing the bowels away from the anterior abdominal wall. It may be tympanitic when the infiltration is covered with distended bowels; I do not, however, consider percussion of any particular value in the early forms, which, in our days, usually will be treated by early operation.

TEMPERATURE, PULSE, ETC.

The higher we find the temperature and pulse in the beginning the more serious will the attack be, as a rule, and the more probable the formation of an abscess or gangrene with perforation. Perforation may, however, also occur with slow pulse and low temperature. We often see after perforation that the temperature falls or even becomes subnormal, while the pulse becomes quick and small. The initial temperature ranges from 102° to 104°, but it may reach 105° F. In the milder forms there is a steady fall of the temperature after the first day or two, while in cases in which suppuration occurs there is continuous fever from the first day of illness till the abscess is opened.¹ Occasionally we see a sudden cessation of the fever. Hawkins considers it probable that it coincides with the discharge of an abscess into the bowel. In cases of gangrene and diffuse peritonitis the temperature frequently is low for two or three days before death; it may, however, rise to 104° or 106° F.

The pulse is proportionate to the temperature in the adhesive and suppurative cases, but has no relation what-

¹ Hawkins, loc. cit., p. 87.

ever to the temperature in cases of perforation with diffuse peritonitis. I consider the pulse of far more importance than the temperature. A pulse considerably quicker than the temperature would lead us to expect (for instance, pulse 130, temperature 100° F.) shows, in my experience, that perforation has occurred and that diffuse, septic peritonitis is present. A high pulse-rate is, therefore, one of the most important symptoms, and has a distinct bearing on the question of operation. Willy Meyer¹ says pointedly, and I perfectly agree with him, that if the pulse, with all symptoms well developed, has a tendency to go above 116 or 118, still more if it goes up to 120 or higher, and stays there, we should operate at once. If this happens with low temperature, operation is still more urgent. Other surgeons also emphasize the importance of the pulse.

A **chill** shows that suppuration has occurred and that absorption of its products has commenced. It may, however, be absent even in cases with large abscesses.

Costal respiration, particularly in males, is an important symptom of diffuse peritonitis, but may occur in a moderate degree in gangrenous forms without perforation. I also consider this an absolute indication for immediate operation. The greater the meteorism the more perfect the costal respiration.

The **tongue** is more or less furred in the milder forms, dry and fissured in diffuse peritonitis.

Irritable Bladder.—This symptom is found only in cases of long inflamed appendices extending downward into the pelvis and depends probably on a pericystitis. Hawkins² found it present in five of one hundred and ten cases.

¹ Medical Record, February 29, 1896.

² Loc. cit., p. 78.

Contraction of the Ilio-Psoas Muscle.—This contraction is stated by different authors to be quite a constant symptom. I have, however, never seen it, and I consider it an exception. The ilio-psoas muscle is well protected by the strong iliac fascia, and I believe it is quite an exception to find a retroperitoneal abscess perforate this fascia and attack the muscle itself.

LEUCOCYTOSIS.

Leucocytosis, according to Cabot's¹ definition, is the presence in the blood of an increased number of white cells of the same varieties morphologically as those in normal blood, a plurality in the inflammatory form—and generally an overwhelming plurality—being polynuclear. It is found particularly where pus is present. Richardson considers it an invariable symptom in perforative appendicitis. I believe it is always present where we find pus, and I have demonstrated it in very early cases before other distinct symptoms of suppuration were present. In doubtful cases of appendicitis its presence will be of diagnostic value. There is no leucocytosis in typhoid fever. In a recent case at the Sisters' Hospital the presence of leucocytosis in a supposed case of typhoid fever led to the discovery and early operative treatment of a subphrenic abscess.

URINE.

The urine is usually high-colored, containing in the septic cases some albumen. It is diminished in quantity according to the fall of the arterial tension; it may cease completely; occasionally it contains indican. Purdy²

¹ Sprague, Diagnostic Value of Blood Examinations, Medical Record, September 26, 1896.

² Practical Urinalysis and Urinary Diagnosis, Philadelphia, 1895, p. 44.

believes the appearance of large quantities of this substance indicates that abundant albuminous putrefaction is progressing in some part of the system. In obstructive diseases of the small intestines, he says, its excretion is enormously increased.

DILATATION OF THE VEINS.

This symptom is frequently seen in the right iliac region and simply indicates great tension in the deeper layers. It is proportionate to the size and extension of a localized infiltration and abscess.

GENERAL SYMPTOMS.

These depend upon the extent and severity of the peritonitis. There is great restlessness; the voice is feeble; the facial expression is anxious, with deep-set eyes and sharp features,—*facies Hippocratica sive abdominalis*; the increasing meteorism, with short, thoracic respiration, the small, quick and feeble pulse, the persistent vomiting, and the profuse, clammy perspiration are all symptoms of general peritonitis. The extremities become cool on account of interference with respiration and circulation, the secretion of urine ceases, and death ensues at last as the result of œdema of the lungs. The pains cease towards the last; the patients are in a condition of euthanasia and, as a rule, conscious almost to the end.

CHRONIC RECURRING APPENDICITIS.

This form is characterized by the occurrence of distinct attacks separated by well-defined intervals. The attack itself is in no way different from that of any other form, and may lead, although not frequently, to perforation with

local or diffuse peritonitis. The symptoms depend, therefore, upon the severity of the attack. During the interval the patient complains of more or less light, gastro-intestinal disturbance, accompanied by mild, often lancinating pains, or an indescribable feeling of heaviness and tenderness in the ileocaecal region, which continually calls the patient's attention to this region, particularly when he stands erect. One or more attacks have, as a rule, preceded these symptoms. In the majority of these cases we will by Edebohls's method (which will be described later) be able to feel a hard, indurated, tender, and more or less adherent appendix. Some authors describe also as a distinct variety *relapsing appendicitis*, in which perfect recovery takes place before a new attack occurs. I consider this form doubtful, and believe, upon the whole, that it does not exist.

Fowler¹ mentions as special forms *subacute*, *chronic*, *recurring*, and *relapsing* appendicitis. I see no reason for making these subdivisions. If perfect recovery fails to take place,—and I believe it happens only in the mildest cases, which cannot be diagnosed clinically, or after perforation with formation of a local abscess and destruction of the appendix, or, lastly, in total obliteration of the appendix,—pathological changes will occur in the appendix, which will lead to relapses sooner or later. These pathological changes are all chronic in their nature, and consist in thickening of the mucous membrane, with formation of strictures, dilatations, adhesions, and bends, all favoring the development of coprolites and the growth of microbes, and, in that way, recurrence of the attack. They all come in under the name chronic recurring appendicitis.

¹ *Annals of Surgery*, January, 1894, p. 36.

COMPLICATIONS AND SEQUELS.

Various complications may be met with during the course of appendicitis.

Peritonitis, unless we consider it merely a symptom, is necessarily the most frequent and, on account of the great mortality, the most important.

Intestinal obstruction is a very important, although not very frequent, complication. It may be due to adhesions and agglutinations of the coils or to the formation of adhesive bands. Mild forms are not uncommon in the adhesive variety, on account of paresis of the affected neighboring part of the intestines. They are accompanied with borborygmus. The severe forms happen more frequently in cases of local abscess. In ten fatal cases of perityphlitic abscess Hawkins¹ found that intestinal obstruction was the cause of death in four cases. I have seen three such cases, in connection with perityphlitic abscesses. In one case, whose history I do not possess, the patient had been sick six weeks with appendicitis. During the last two weeks he had all the symptoms of intestinal obstruction, with incessant fecal vomiting. At the consultation I found an enormous intraperitoneal abscess, containing several quarts of pus and occupying almost the whole right side of the abdomen. It contained fecal concretions. The operation did not relieve the obstruction and the patient died five days later. No further operation and no post-mortem were allowed. (In regard to the second and third cases, see Cases No. 69 and No. 75.) It may also result from diffuse peritonitis, on account of the adhesions. The prognosis is better in these cases, as the obstruction rarely is absolute, and as the adhesions gradually become absorbed again.

¹ Loc. cit., p. 94.

Pylephlebitis and Hepatic Abscess, etc.—The hepatic abscess depends upon the extension of a septic thrombosis, starting in the veins of the mesentery or the omentum, through the portal vein into the liver; or it may be the result of a septic embolus, in which case we may find a single liver abscess. The pylephlebitis is, however, the primary lesion. Hawkins¹ had one case of hepatic abscess in thirty-eight cases; Fitz,² eleven in two hundred and fifty-seven cases. I³ have seen this complication once in seventy-five cases. (See Case No. 42.) In some cases infection passes beyond the liver and becomes systemic with abscesses in the brain, lung, etc. Bryant⁴ mentions a case in which there was found an abscess of the liver and another between the diaphragm and the liver, which had extended to the pericardium and produced suppurative pericarditis.

Pylephlebitis is absolutely fatal. A simple hepatic abscess from embolus may recover by operation. The symptoms of pylethrombosis depend principally upon the occlusion of the portal vein, and consist in rapidly occurring ascites, swelling of the spleen, watery diarrhœa mixed with blood, and dilatation of subcutaneous veins, —*i.e.*, caput Medusæ. The symptoms of pylephlebitis depend less upon occlusion of the portal system than upon septic and thrombo-pyæmic processes. We shall probably meet these complications less frequently as early operations are performed.

Instead of pericarditis right-sided *pleurisy* has been observed. It may also complicate diffuse peritonitis. Hawkins⁵ mentions several such cases, and calls attention

¹ Loc. cit., p. 97.

² Loc. cit.

³ International Journal of Surgery, April, 1896.

⁴ Harveian Lectures, British Medical Journal, December 20, 1884, p. 1228.

⁵ Loc. cit., p. 111.

to the bacillus coli, which has been found in lung complications after intestinal diseases. Bryant¹ mentions an abscess perforating the diaphragm and followed by pneumonia and another followed by double pleurisy.

Phlebitis and thrombosis of the iliac vein, succeeded by œdema of the right leg, may occasionally be found. Hawkins² thinks it probably depends upon contraction of inflamed retroperitoneal tissue around the iliac vein. I believe it depends more upon great prostration and weak circulation, as I in one case (No. 13) found thrombosis of the left femoral vein. That such a thrombosis may produce emboli in the lung is evident; I have myself met with such a case. (See Case No. 9.)

Fatal hemorrhage has occasionally occurred by ulceration of the walls of the vessels. Bryant³ mentions one case from ulceration of the deep circumflex artery, Fowler⁴ another from ulceration of the iliac vein.

Parotitis.—Stephen Paget⁵ has collected one hundred and one cases of inflammation of the parotid following injury and disease of the abdominal wall and pelvis, fifty of which were due to injury and disease of the generative organs, eighteen to injury and disease of the alimentary canal, and twenty-three to injury and disease of the abdominal wall, peritoneum, and pelvic cellular tissue; in five cases it followed perityphlitis. Floystrup⁶ saw three cases in one hundred and fifty-six cases of perityphlitis at Commune Hospitalet in Copenhagen. This form

¹ British Medical Journal, December 20, 1884, p. 1128.

² Loc. cit., p. 100.

³ British Medical Journal, December 13, 1884, p. 1183.

⁴ Annals of Surgery, January, 1894, p. 41.

⁵ Parotitis after Injury and Disease of the Abdomen and Pelvis, British Medical Journal, March 19, 1887, p. 614.

⁶ Perityphlitis og. dens Behandling, Kjöbenhavn, 1888, p. 32.

of parotitis is not, as a rule, accompanied with signs of septicæmia or pyæmia. Septic symptoms were present in only fifteen of Paget's one hundred and one cases, and secondary abscesses in the lung and kidney were found in only seven. In no case were joint affections present. The affection has no fixed period of incubation and runs no regular course. There are generally no rigors nor is there any great rise of temperature. It may subside, start up and subside again, and the danger lies not in the parotitis, but in the primary lesion.

Fecal fistula is seen less often in our days, on account of early operation. Formerly, when a perityphlitic abscess was left to itself, it discharged in favorable cases into the cæcum, ileum, bladder, rectum, or vagina, or outward through the abdominal wall. Bull¹ saw in forty-seven such cases perforation occur externally through the abdominal wall twenty-eight times, into the cæcum fifteen times, into the rectum twice, and into the bladder twice. Paulier² gives the proportion of external fistulæ as much less: among forty-six cases only four opened externally while fifteen opened into the cæcum. In our days fistulæ happen occasionally after operation, from the ligature cutting through the appendix or when applied around gangrenous appendices. Dawbarn's method of treating the stump by invagination prevents absolutely such an eventuality, but it cannot be used when the appendix is gangrenous up to the insertion. In such cases part of the cæcum may also become gangrenous. External fistulæ may occur not infrequently after operations on local circumscribed abscesses in which the appendix is left behind. This happened twice in my seventy-five cases. These fistulæ heal spontaneously, however, in a few weeks.

¹ Quoted by Kelynnack, loc. cit., p. 133.

² Ibid.

Appendicitis complicating pregnancy leads to miscarriage and seems to be often fatal. Fowler¹ had four cases in one hundred and forty-three cases of appendicitis, all entering with diffuse peritonitis and all dying. Howard Crutcher² reports another fatal case, in which miscarriage occurred in the eighth week of pregnancy. The patient developed apparently septic peritonitis, thought to be due to puerperal sepsis. Eighteen days later a median explorative laparotomy was made and an enormous perityphlitic abscess opened, which depended upon a perforated appendix. I do not see why this complication should be so serious if the diagnosis is made early and operation performed in time.

Phlegmonous inflammations of the pelvic connective tissue, in the lumbar region, around the kidney, in the anterior abdominal wall, etc., are mentioned as complications by different authors. I do not consider them complications at all. They are simply the normal development of abscesses dependent upon abnormally situated appendices.

DIAGNOSIS.

Few diseases have a more uniform set of symptoms than appendicitis. The cardinal symptoms—sudden onset with fever, pain in the right ileocaecal fossa, rigidity of the abdominal wall, vomiting and nausea followed by tumor—are as characteristic of appendicitis as the violent chill, the pain in the side, and the rusty expectoration are of pneumonia.³ Few diseases, however, present so many stages, each characterized by a different set of symptoms, and yet only in degree differing from the pre-

¹ *Annals of Surgery*, January, 1894, p. 46.

² *Medical Record*, September 26, 1896.

³ Talamon, *loc. cit.*, p. 145.

ceding and following stages; every one of the cardinal symptoms may be lacking or indicate something else. It is their combination and their appearance in a distinct order that make the diagnosis sure. The pain, for instance, may be lacking in the ileocæcal region, when there is a long appendix, inflamed in the tip, extending down in the pelvis. It may be completely absent in a totally gangrenous appendix, and the patient be resting quietly in bed with normal temperature, pulse, and respiration.¹ "The reason why the appendix is free from tenderness is because it is dead, nerves and all." The temperature and pulse are normal because toxins are not escaping into the general circulation. The severity of the pain may be of all degrees, from a local tenderness to the most excruciating agony. The tumor may be absent in very acute forms, with rapidly diffuse peritonitis, or in retrocæcal or pelvic positions of the appendix; similar conditions may lack the otherwise constant symptom of rigidity of the abdominal wall. One symptom, however, *tenderness to pressure*, is always present, but even this may be found with other conditions than appendicitis.

Edebohls's method of palpation is an important diagnostic advance.² He maintains that a competent gynecologist is able to palpate a normal tuba, not to mention a pathological and swollen one, and he has shown that in most cases (in not too fleshy individuals) it is just as easy to palpate a normal appendix as a normal tuba, and that palpating a pathological, stiff, and swollen appendix is a very simple thing after some experience. We might theoretically suppose that it would be difficult or impos-

¹ Morris, Lectures on Appendicitis, New York, 1895, p. 41.

² Diagnostic Palpation of the Appendix Vermiformis, American Journal of the Medical Sciences, May, 1894.

sible to palpate the appendix, on account of its variable position and of its frequent situation behind a cæcum filled with fecal matter. We may in regard to the first point state that the insertion of the appendix is approximately constant at McBurney's point and that only the outer end varies. We may, therefore, feel confident of being able, in the majority of cases, to palpate the inner part of the appendix, and the condition of this part will give us valuable information about the condition of the rest of the appendix. In regard to the second point, Edebohls insists that it is a mistake to believe that the cæcum normally is filled with fæces; on the contrary, it is, according to his investigations, generally empty and collapsed, and the appendix may be palpated through its walls.

The palpation is done as follows: The patient lies on his back, with limbs flexed at the hips. Placing three or four fingers of our right hand flat on the abdomen, we feel for the margin of the right rectus muscle, in the line between the navel and the anterior superior spine of the ilium. The fingers are introduced with a light, steady pressure under the margin of the rectus until we feel distinctly the pulsation of the common iliac artery. The appendix is felt, as a rule, just outside the artery, its insertion about an inch distant, while its tip often crosses the artery. We move the fingers slowly outward as soon as we feel the pulsation of the artery and note with care the condition of the posterior abdominal wall,—that is, the ileo-psoas muscle covered with the iliac fascia. This is the point of resistance against which we compress the appendix and which makes it possible to palpate it. I have, as a rule, found it advantageous to apply the left hand on the palpating right hand; we are thereby able to press more evenly and steadily. The normal appendix

is felt as a thin, flat band which slips away under the fingers and is painless. It feels hard, round, unyielding, and more or less movable and tender under pressure, when it is in a condition of chronic inflammation. We may also, as a rule, get a reliable idea about the direction of the appendix, except when it extends downward into the pelvis.

I have in a number of cases made out its position by palpation and verified it during the succeeding operation. The method is of exceeding importance in chronic appendicitis, and an operation is not indicated unless we feel the thickened and swollen appendix. We cannot, of course, use the method in acute forms except just at the commencement; the pain is too severe, and we run the risk of rupturing a gangrenous or pus-filled appendix. The palpation is still easier under narcosis. I have, nevertheless, in several cases, where I felt sure of feeling a hard, indurated appendix extending downward, found it in a diametrically opposite direction. What I felt was the flat tendon of the psoas minor muscle, which in a thin subject may feel like a hard, indurated cord.¹ We may, therefore, say that the diagnosis of appendicitis usually is easy by a careful consideration of the different symptoms appearing in a certain order, although a great many different lesions may present one or more of these symptoms. They will be mentioned under the differential diagnosis.

Another question, however, is whether we can diagnose *the form of the appendicitis* present, particularly whether it will perforate, or has already perforated, or is forming a localized abscess. The importance of these questions cannot be too much emphasized, as they are intimately

¹ Henle, Handbuch der Muskellehre des Menschen, p. 243.

connected with the prognosis and the treatment. Murphy¹ says (and I believe all surgeons will agree with him) that we can positively determine when appendicitis is present, but that in most cases we cannot say how extensive, how dangerous, and how far-reaching the effect of that appendicitis may be. We have no sign, symptom, or combination of signs and symptoms that indicates with any degree of certainty suppurative peritonitis in the early stages. The diagnosis is easy enough if we wait till the disease has developed and the symptoms of a local abscess or diffuse peritonitis are present, but we have then lost the favorable time for operation and will lose a number of our patients who by earlier operation surely would have recovered.

In regard to the question whether an *appendicitis will perforate*, we must fairly acknowledge that we are in many cases unable to forecast the future. Talamon² believes that chronic relapsing appendicitis is the only form in which we may feel confident that perforation will not occur, and even then only after the third or fourth attack, the perforation being less and less probable the more frequently the attacks are repeated. I do not, however, believe that this is a correct statement. Of fifty patients of mine who either had perforation with local circumscribed abscess or diffuse peritonitis, or else had total gangrene of the appendix without perforation, twenty-nine gave a history of no previous attacks, while four had had one attack, five two attacks, six three attacks, one four attacks, and two many attacks. Forty per cent. of my suppurative cases may therefore properly be designated as chronic recurring cases, while twenty per cent. had had three or more attacks. We can scarcely, there-

¹ Medical News, January, 1895.

² Loc. cit., p. 170.

fore, agree with Talamon that we are able to foresee from the beginning the course of the disease in the chronic recurring forms.

Hawkins¹ says that "whether the onset is sudden and severe or gradual and mild, no man can foretell in the first twenty-four hours whether resolution or suppuration will be the outcome. Neither the height of the initial fever nor the severity of the pain, vomiting, or general constitutional disturbances can be taken as giving any clue to the subsequent course of the disease."

It is quite another question *whether perforation has already occurred*. Talamon² states that by the third or fourth day, in the immense majority of cases, the difficulty of diagnosing this hardly exists, as at that time one either observes or does not observe the signs of an acute peritonitis. The point, however, is to diagnose it before acute peritonitis is present, and not to wait for the symptoms of peritonitis. Murphy³ states that fifty per cent. of the fatal cases die before the sixth day, many on the fourth, and a smaller number on the second, and that the surgeon who waits until the sixth day necessarily will lose fifty per cent. of all the cases that would die without operation.

We do not, however, lack important symptoms of warning during the first two days, even if we cannot in every case be absolutely sure of the condition of the appendix and the probable course of the disease. First of all, I wish to call attention again to the great importance of the pulse-frequency. If this corresponds to the height of the fever we may feel comparatively secure, but if the pulse rises quickly to 110 or 115, or if it goes up to 120 or higher and stays there, perforation is probably

¹ Loc. cit., p. 84.

² Loc. cit., p. 172.

³ Medical News, January 5, 1895.

present and diffuse peritonitis developing, although perforation may occur with low temperature and slow pulse.

The severity of the pain is also in the majority of cases of diagnostic importance: I believe that severe pain shows that perforation has already occurred. Fitz¹ has particularly called attention to this point. Sudden severe pain occurred in two hundred and sixteen of two hundred and fifty-seven cases,—*i. e.*, eighty-four per cent.,—in a few following diarrhœa, but in most instances occurring in apparently healthy individuals. He considers the sudden pain presumably due not to the actual beginning of the disease, but to separation of fresh adhesions and often, perhaps usually, to perforation of the inflamed appendix. In sixty-one cases this occurred on the first day in forty-one cases, or sixty-seven per cent., on the second day in five cases, or eight per cent., on the third day in twelve cases, or nineteen per cent., on the fourth day in two cases, or three per cent., on the fifth day in one case, or two per cent. Shrady,² too, has the same opinion, and states that the sudden occurrence of intense localized pain usually indicates a dangerous change, either perforation or the tearing of adhesions and rupture of an abscess, and, when combined with shock, indicates effusion into the peritoneal cavity.

Another symptom of importance is seen when the patient after twenty-four hours is getting worse instead of improving, and when slight rigidity of the abdominal muscles occurs in the ileocæcal region. If these three symptoms are all present, there is almost absolute certainty of perforation.

A third question of importance is whether we can in

¹ American Journal of the Medical Sciences, October, 1886.

² Some Points on the Diagnosis of Appendicitis, Medical Record, January 6, 1894.

early cases *diagnose the presence of pus* and the formation of a local abscess. Talamon¹ considers it almost impossible during the first week. Hawkins² thinks we must rest our diagnosis of pus upon the continuance or increase of symptoms at a time when in non-suppurative cases resolution should set in. The larger the indurated mass and the quicker it forms the greater the probability of pus. The indurated mass, however, may be lacking in cases in which the abscess is within the pelvis and beyond abdominal examination, although fever continues, or it may depend upon a thickened and adherent omentum. Neither is a continuous fever a sure sign, as it may depend upon pylethrombosis, liver-abscess, and other complications. One symptom, however, I believe, is always present where there is pus, even in early cases, and that is inflammatory leucocytosis with polynuclear cells. Exploratory puncture is hardly ever used. It is unnecessary when a large abscess is present, and dangerous when the abscess is small, as it leaves a track through which infection may take place.

DIFFERENTIAL DIAGNOSIS.

A number of different diseases, which may have one or more symptoms in common with appendicitis, may be mistaken for appendicitis. I shall mention the most common ones.

Typhlitis Stercoralis.—That typhlitis stercoralis exists has been shown both at autopsies and at operations, as severe forms of typhlitis and perityphlitis have been found to be dependent upon stercoral ulcers of the cæcum in cases where the appendix was normal. It can be recognized with certainty only by the initial presence of a doughy, sausage-shaped tumor in the cæcal region,

¹ Loc. cit., p. 173.

² Loc. cit., p. 85.

associated with the usual symptoms of appendicitis in a modified form,—*i. e.*, less local tenderness and vomiting, constipation, and moderate fever. The tumor, however, at the very beginning of an attack of apparent appendicitis would justify the diagnosis of typhlitis stercoralis, and in the absence of that symptom it would be safer to consider it appendicitis.¹ Shrady,² who considers typhlitis quite common, mentions, as a frequent symptom, that indentation can be made in the tumor on account of its fecal contents. Kelynack,³ too, considers it very common, particularly in people in feeble health and advanced in life; other authors find it especially in corpulent, sedate, elderly gentlemen.

I consider this disease much more common than is usually believed, and will here call attention to Renvers's⁴ statistics from the German army, which probably have been looked upon by most surgeons with a great deal of scepticism. Renvers states that of two thousand cases of perityphlitis in the German army ninety-six per cent. recovered, and that of fifty-four cases observed by himself but three died. He thinks the majority of cases that present themselves to physicians are simply cases of typhlitis stercoralis, which leads to severe irritation in the surroundings of the cæcum and may produce phlegmonous inflammation with high fever and severe peritoneal symptoms. The etiology, he states, is constipation, and the examination reveals in the very beginning a considerable, easily-felt swelling in the ileocæcal region, which may extend up above the anterior superior iliac spine. The fever, pain, and irritation disappear in a week and

¹ White, Therapeutic Gazette, June 15, 1894, p. 17.

² Medical Record, January 6, 1894.

³ Loc. cit., p. 151.

⁴ Deutsche Med. Wochenschrift, January 29, 1891.

are followed by permanent recovery if we succeed in removing the fecal impaction. The majority recover by the use of purgatives or enemata, rest, and diet. This, he says, is the process in otherwise healthy individuals. It is not very remarkable that ninety-six per cent. recover from this complex of symptoms, which surely is that of fecal impaction and not that of appendicitis. The only thing remarkable is that these statistics have been quoted again and again as proof of the benign character of appendicitis, of the curative influence of medical treatment, and of the lack of necessity for operative proceedings. Only a small number of patients, he concludes, with diseases in the fossa iliaca dextra need surgical treatment. It is, in my opinion, not improbable that German soldiers, who march and exercise continually in heavy uniforms, perspiring profusely, and who live principally on a diet of rye bread and sausage, should suffer from constipation and fecal impaction.

Vollert's¹ statistics from Nothnagel's clinic in Wien, of sixty-five cases with three deaths, point towards the same trouble. He advises against operation during the first few days, "as we meet many cases which commence with the most acute symptoms, high fever, severe pains, and large tumor in the ileocaecal region, all of which symptoms disappear under expectant treatment, if not on the second day, then after a few days." No surgeon would think of operating on such cases, and no surgeon believes that genuine cases of acute appendicitis recover under expectant treatment, "if not on the second day, then after a few days." Sahli does not believe in typhlitis stercoralis as a distinct disease. If it does exist, it plays only exceptionally a *rôle* in the production of peri-

¹ Deutsche Med. Wochenschrift, No. 33, 1891.

typhlitis. Operations show almost always that perityphlitis depends upon appendicitis, and the best thing a physician can do is to forget the name typhlitis stercoralis.

Diffuse peritonitis may result from the perforation of chronic gastric and duodenal ulcers, which frequently are latent, as well as perforating ulcers of the appendix, from typhoid and tuberculous ulcers, and occasionally from malignant diseases of the stomach and intestines.¹ The diagnosis may be difficult if diffuse peritonitis is already present when the patient comes under observation. The diagnosis depends upon a careful consideration of the previous history.

Typhoid Fever.—Suspicion of appendicitis is not at all uncommon in the first week of typhoid fever. The moderate fever with pain and tenderness in the iliac region and slight meteorism may suggest appendicitis. I have myself been called to operate for supposed appendicitis in two such cases. A careful study of the temperature, the previous history, and the general character of the disease will, however, clear up the diagnosis. Fitz² says that the symptoms in typhoid fever which suggest “a perforation of the bowel are those which in the absence of typhoid fever would be regarded as diagnostic of an appendicitis. The symptoms are not merely similar: they are identical.” The symptoms of perforation in typhoid fever occur, however, rarely before the third week, and I should think it almost impossible at that time to make a wrong diagnosis between typhoid fever and a perityphlitic abscess of three weeks’ duration.

Intestinal Obstruction.—This may depend upon many different pathological conditions, such as intussusception,

¹ Kelynack, loc. cit., p. 151.

² Transactions of the Association of American Physicians, vol. vi. p. 208.

volvulus, occlusions from adhesions and fibrinous bands, internal ruptures through tears in the mesentery, new growths, pressure from abdominal tumors, not to mention congenital malformations. Intestinal occlusion appears, however, with symptoms which in the main are the same as those of appendicitis,—*i.e.*, pain, vomiting, meteorism, and symptoms of diffuse peritonitis,—and it is not, therefore, remarkable that these cases now and then give occasion to wrong diagnoses. We will, nevertheless, discover essential differences when we analyze the symptoms. The pains are most severe in the umbilical region or the region where the lesion is found, but they do not become localized in the ileocæcal region. Vomiting is constant and not intermittent, as in appendicitis, becomes quickly fecal, and is accompanied by obstinate constipation. Meteorism appears earlier and is more universal. Tenesmus and bloody diarrhœa will in some cases point towards volvulus, and rectal exploration may then be of importance. In intussusception the tumor can generally be recognized, oblong in shape and following the course of the colon, without marked local tenderness or increase of temperature. Adhesions and internal strangulations from fibrinous bands present generally a history of previous peritonitis. We shall, therefore, by a careful analysis of the symptoms, be able to arrive at a probable diagnosis. Exploratory laparotomy is indicated as a final resort and will clear up the diagnosis.

Affections of the gall-bladder have now and then been mistaken for appendicitis. A few years ago I operated on a patient for supposed chronic appendicitis. I found that the swelling depended upon a long, sausage-like gall-bladder which extended downward into the ileocæcal region and contained one hundred and twenty-six gall-stones. I, therefore, performed cholecystenterostomy with

Murphy's button, which was discharged by the rectum on the twenty-third day. Perforation of the gall-bladder, too, may give symptoms not unlike those in certain forms of appendicitis.

The differential diagnosis between *appendicitis*, *gall-stone colic*, and *renal colic* may offer some difficulty, as they all give similar symptoms of pain, vomiting, and general ill feeling. Fowler¹ gives the following table of differential diagnosis:

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

Movable Kidney.—The symptoms of periodical hydro-nephrosis dependent upon prolapsed kidney may simulate those of appendicitis by the abdominal pain, chills, nausea, vomiting, and fever.² The cardinal symptoms of appendicitis are, however, absent, the tumor is movable and of the shape of the kidney, and may suddenly decrease in size contemporaneous with the discharge of a great deal of urine.

Extra-Uterine Pregnancy.—A patient entered the

¹ Annals of Surgery, February, 1894, p. 16.

² Osler, Principles and Practice of Medicine, New York, 1894, p. 720.

Sisters of Charity Hospital two years ago with the diagnosis of appendicitis. She was extremely weak, had a quick, small pulse, meteorism, and a hard, tender swelling in the right ileocaecal region. She had a waxy color, and was excessively anæmic; had not menstruated for two months. An exploratory laparotomy showed a ruptured tubal pregnancy on the right side and the pelvis filled with coagulated blood. Symptoms of internal hemorrhage, with collapse, following cessation of menstruation and accompanied with symptoms of pregnancy, bloody vaginal discharge, and a tender and sensitive mass in the fornix vaginae, point towards extra-uterine pregnancy.

Acute Irritant Poisoning.—Kelynack¹ mentions that the onset of perforative appendicitis may be so sudden as to suggest to the patient's friends the possibility of poisoning, the more so as the first severe symptoms may occur shortly after a full meal.

Coxitis.—Gibney² calls attention to the possibility of mistaking coxitis for appendicitis. I had one patient enter the hospital with the diagnosis of coxitis, on whom I operated for chronic appendicitis, with disappearance of all symptoms. (See case No. 67.)

Pyosalpinx.—Hawkins³ thinks it impossible in some cases to distinguish between an abscess of appendicular origin and one arising around a Fallopian tube, but, as an exploratory operation is necessary in both, he does not consider it of great moment. As a general rule, however, I should consider the differential diagnosis easy. Bimanual examinations will show a mass in the lateral regions of the fornix vaginae, the womb will be more or less immovable, and the whole history will be one of uterine

¹ Loc. cit.

² American Journal of the Medical Sciences, January, 1881, p. 119.

³ Loc. cit., p. 91.

troubles. H. V. Vineberg¹ thinks it next to impossible in catarrhal salpingitis to palpate a slightly thickened tube when the abdomen is rigid and extremely sensitive. The following points he considers of importance for the diagnosis from acute appendicitis. In appendicitis the pain is frequently more excruciating than in salpingitis, is more likely to be limited to the abdomen, and does not usually radiate to such an extent as in salpingo-oophoritis. When the ovary is involved with the tube, as it frequently is, the pain commonly descends into the corresponding thigh. Gastric disturbances are common to both. In salpingitis the alarming symptoms usually subside to some extent in the course of three or four days, while in appendicitis they may continue or grow more severe. In doubtful cases examination under narcosis should be made.

Ureteritis.—Deaver² calls attention to this lesion, which may complicate cystitis or tuberculosis and calcareous diseases of the kidney. The history, the presence of pus and blood in the urine, the pain and swelling discovered by rectal or vaginal examination of the ureter near its entrance into the bladder, the lack of the cardinal symptoms of appendicitis, will all help to clear up the diagnosis.

Deaver³ mentions a number of other affections which might occasion a wrong diagnosis under certain circumstances. **Psoas** and **lumbar abscesses** would be distinguished by their tuberculous history, their slow growth, and the accompanying deformities; **cancer of the cæcum**, by the absence of inflammatory symptoms, the nodular swelling, the symptoms of cachexia, their appearance late in life, their slow growth; **tuberculous peritonitis**, by

¹ Medical Record, November 21, 1896, p. 738.

² Loc. cit., p. 101.

³ Loc. cit., pp. 104, 112.

the history, by other tuberculous affections, early appearing ascites, hectic and night-sweats, etc.

PROGNOSIS.

The prognosis is, at best, doubtful in acute cases, and depends in a predominant degree upon the treatment adopted. Under medical treatment the prognosis is, as Fowler¹ says, the more unfavorable the more serious the attack is, and under surgical treatment the more unfavorable the later the operation is performed. He observes, however, that many light cases undoubtedly recover, but adds also that many cases die which commence very mildly. There is a great discrepancy in the mortality-tables as furnished by physicians and surgeons. Physicians, to be sure, see many early cases recover, at least apparently, as we have no reliable statistics from their side in regard to relapses. They consider, therefore, appendicitis on the whole a benign disease. Surgeons, on the other hand, who see the severe and fatal cases, consider appendicitis one of the most dangerous and insidious of diseases, attended with a high mortality.

Von Bergmann² thinks that cases which recover by expectant treatment have been either cases of typhlitis or acute attacks of chronically inflamed appendices which do not go on to perforation. It is difficult or impossible to find the relative frequency of the mild and the severe cases. Talamon³ thinks that half the cases belong to the mild forms, although he acknowledges that there are no authentic statistics, as these light cases are not ordinarily published, and that therefore only one kind of

¹ *Annals of Surgery*, March, 1894, p. 327.

² *St. Petersburg Med. Wochenschrift*, 1892, No. 41, reported in *American Journal of the Medical Sciences*, 1893, p. 332.

³ *Loc. cit.*, p. 137.

statistics will be of real value,—viz., such as shall group together all the cases observed in a hospital in a certain number of years, with a full account of the mode of termination, of the complications, and of the treatment employed. Pepper¹ states that the affection certainly is a grave one, although probably the majority of cases (nine-teen out of twenty) will recover, even without surgical treatment. It is dangerous, however, in every case, since there are no criteria by which we can predict whether the inflammation will be severe or light. The statistics from hospitals, however, do not agree. P. Guttman² reports from the Moabit Hospital in Berlin ninety-six cases from 1879 to 1890. Only five of these patients died. In a few cases, he states, there were serious complications. The inference is, therefore, that the great majority were light forms. Fowler³ observed in ten years at the Middlesex Hospital ninety-nine cases with a mortality of fifteen per cent. How many were cured permanently is not mentioned in the Hospital reports, and this question is of the greatest importance. McDougall⁴ gives the mortality of one hundred and fifty cases during the last three years in Edinburgh Royal Infirmary at thirty-seven, *i.e.*, twenty-five per cent., and in St. Bartholomew's and St. Thomas's Hospitals at twenty per cent. Prof. With's⁵ statistics from 1879 showed twelve deaths in thirty cases, *i.e.*, forty per cent. mortality, under more or less strict opium treatment. In later statistics of fifty cases he had under strict opium treatment a mortality of sixteen per

¹ Text-book of the Principles and Practice of Medicine, Philadelphia, 1894, vol. ii. p. 823.

² Berliner Klinische Wochenschrift, March 16, 1891, p. 294.

³ Quoted by Talamon, p. 138.

⁴ Medical Record, August 29, 1896, p. 311.

⁵ See Festskrifter ved Kjöbenhavns Universitet, 1879.

cent. Floystrup's¹ statistics of one hundred and fifty-six cases, treated from 1875 to 1887 in Prof. Trier's division in the Commune Hospital in Copenhagen, showed a mortality of fifteen and six-tenths per cent. under strict opium treatment. These statistics agree pretty well with those of other physicians. J. W. White² deplotes the lack of reliable medical statistics, but believes the facts to be as follows: about eighty per cent. recover under medical treatment; of the remaining twenty per cent. at least one-half may be saved by operation during the condition of localized abscess, while of the other half, suffering from perforation with diffuse peritonitis, a certain proportion would recover by early operation. The mortality under strictly medical treatment would therefore be about twenty per cent., more or less, while by operating on the severe cases it would be reduced to five or eight per cent.

Dr. Samuel Lloyd,³ of New York, in order to compare conservative with operative treatment, has examined five hundred and fifty-eight cases, all serious enough to be published, and his conclusions are, to say the least, startling. Of the five hundred and fifty-eight patients, two hundred and sixty-three recovered and two hundred and ninety-five died, the mortality being fifty-three per cent. Two hundred and twenty-six were operated upon, of whom thirty-one died,—*i.e.*, a mortality of thirteen per cent.; while of two hundred and sixty-five patients who were treated conservatively, two hundred and five died,—*i.e.*, a mortality of seventy-seven per cent. Four hundred and forty-five of these five hundred and fifty-eight cases

¹ Perityphlitis or dens Behandling Kjöbenhavn, 1888.

² Therapeutic Gazette, June 15, 1894.

³ Proceedings of the Medical Association of Georgia, April 8, 1896, reported in Journal of the American Medical Association, May 2, 1896.

—i.e., seventy-nine per cent.—resulted in abscess perforation or diffuse peritonitis. This, Dr. Lloyd says, is a dismal showing of conservative treatment. Dr. Wyeth¹ asks pointedly, in regard to these statistics, “whether any sane man would believe that such a mortality rate would have occurred if these five hundred and fifty-eight cases had within the first twelve hours of the attack been turned over to a competent and conscientious surgeon. Under proper conditions, not fifteen of these five hundred and fifty-eight cases, instead of two hundred and ninety-five, would have died.” Lloyd believes that no case of appendicitis should be considered to be purely medical.

Sahli,² on the other hand, reports seven thousand two hundred and thirteen cases from four hundred and sixty-six physicians; four hundred and seventy-three were operated on, with a mortality of twenty-one per cent., while six thousand seven hundred and forty were treated conservatively, with a mortality of eight and eight-tenths per cent. Relapses occurred in twenty and eight-tenths per cent. of four thousand five hundred and ninety-three cases. Sahli considers the high mortality in the operated cases the result of operating only in the severe cases and then often too late. Sonnenburg thinks these statistics prove that simple catarrhal appendicitis is much more frequent than usually supposed. *Under surgical treatment the prognosis depends, in the acute perforative cases with local abscess or diffuse peritonitis, upon the time of the operation.*

In regard to this point, interesting statistics of one hundred and twenty-seven cases have been furnished by

¹ Medical Record, May 9, 1896.

² Sahli, loc. cit., p. 218.

Fowler.¹ Eighty-three per cent. recovered of fifty-eight cases operated on during the first three days; sixty per cent. recovered of nine cases operated on during the fourth day; fifty-eight per cent. recovered of twenty-six cases operated on from fifth to sixth day; fifty per cent. recovered of eighteen cases operated on from seventh to eighth day; thirty-three per cent. recovered of nine cases operated on from ninth to tenth day. This agrees with Murphy's statement that one-half of all patients who would have recovered by operation will die if we wait until the sixth day.

Of Fowler's fatal cases septic peritonitis was present in almost all at the time of the operation. Fitz² found that death in cases of perforative appendicitis occurred in eighty per cent. during the first five days; of one hundred and seventy-six cases sixty died during the first five days, forty-six during the first four days, twenty-eight during the first three days, and eight on the second day.

Porter³ concludes from an examination of four hundred and forty-eight cases that there is less danger in deferring operation in recurrent than in primary cases, a point on which all surgeons will agree. He considers two facts as settled: *first*, when an operation is to be made, the earlier it is done the better the chances of recovery; and, *second*, that the character of the attack and the consequent condition of the patient, and not the number of hours and days of illness, should form the basis of decision as to the proper time for operation. His statistics of four hundred and forty-eight cases, however, do not give any

¹ Annals of Surgery, May, 1894, p. 565.

² Transactions of American Physicians, 1886, p. 126.

³ American Journal of the Medical Sciences, 1893, p. 649.

reliable information, and are positively misleading. They are as follows :

Whole number of cases	448
Whole number of recoveries	371
Whole number of deaths	77
Average mortality, 17.23 per cent.	

1. Removal of appendix during attack, one hundred and fifty-one cases.

Recovered	122,— <i>i.e.</i> , 80.3 per cent.
Died	29,— <i>i.e.</i> , 19.7 per cent.

2. Removal of appendix during quiescence, fourteen cases.

Recovered	13,— <i>i.e.</i> , 92.86 per cent.
Died	1,— <i>i.e.</i> , 7.14 per cent.

3. Incision and drainage of abscess, one hundred and eighty-eight cases.

Recovered	154,— <i>i.e.</i> , 81.82 per cent.
Died	34,— <i>i.e.</i> , 18.18 per cent.

4. Appendicitis without operation, ninety-five cases.

Recovered	82,— <i>i.e.</i> , 86.32 per cent.
Died	13,— <i>i.e.</i> , 13.62 per cent.

We must know, in order to form an intelligent opinion in regard to division No. 1, the condition of the appendix, whether diffuse peritonitis was present or not, the day of the disease on which the operation was performed, etc. It is, in regard to division No. 2, absurd to state that the mortality in operations during the quiescent period is 7.14 per cent.: the numbers are all too small to form an opinion, and we have so many other statistics of operations during this period showing that the mortality, if

not nothing is next to nothing. Bull,¹ for instance, gives statistics of four hundred and forty-two cases with eight deaths,—*i.e.*, one and four-fifths per cent. mortality; Morris² operated on fifty-nine patients and they all recovered; Treves³ had thirty-two cases with one death from other causes than peritonitis; Lennander⁴ had twenty-one cases which all recovered, and I have had twenty-three operations with two deaths from other causes than peritonitis. We hear the same result from all other surgeons. The mortality, if not nothing, is next to nothing. No surgeon will agree to the statement, in regard to division No. 3, that the mortality after incising and draining the abscess is 18.18 per cent. It depends altogether upon how long the abscess has been allowed to progress, and even then the mortality depends upon complications, such as perforation into the abdominal cavity, septicæmia, pylephlebitis, obstruction, etc. There are but few statistics, except in earlier literature, as we do not allow the cases to progress, but operate on them early. These cases are now treated by early laparotomy and with almost unfailing success. We lack in regard to No. 4 all information in regard to the character of the cases treated without operation. If severe, the mortality is too small; if mild, too high. We lack, besides, all information whether there were any relapses during the next few years, about their frequency, character, and mortality.

The mortality under surgical treatment depends almost absolutely on the *number of cases with gangrene, perforation, and diffuse peritonitis*. Wyeth⁵ computes the mortality

¹ Medical Record, 1894.

² Loc. cit., p. 81.

³ British Medical Journal, March 9, 1895, p. 577.

⁴ Loc. cit., p. 115.

⁵ Loc. cit.

from three hundred and sixty-four cases operated on at eighteen per cent., Murphy¹ at nine and six-tenths per cent. from one hundred and ninety-four cases operated on by himself, Morris² at seven per cent. from one hundred personally-operated cases, but only ten of these were cases of diffuse peritonitis. Only three of these ten cases died, probably on account of the thoroughness with which he washed out and drained the peritoneal cavity. He reports other statistics of one hundred cases with two per cent. mortality:³ thirty-four cases were acute forms with abscess, four chronic forms with abscess, twelve acute forms without abscess, forty chronic forms without abscess, and the rest tuberculosis and cancer. Fowler had thirty-two cases with gangrene, perforation, and diffuse peritonitis, and they all died; Fenger, in Chicago, had eleven cases, of which one recovered; I have had thirty-three cases, of which fifteen died and eighteen recovered. These eighteen cases were all operated on early, on the second or third day, and in thirteen of these cases I found the appendix more or less gangrenous without limiting adhesions, while perforation and peritonitis were present in five. Who can doubt that these thirteen patients would all have died under any other treatment, and that they were saved only by the prompt and early operation before perforation had occurred? McBurney⁴ had fourteen recoveries and ten deaths in twenty-four cases (*i.e.*, forty per cent. mortality); Willy Meyer⁵ saved three out of four, if operated on inside of twelve hours, while all died if operated on later; Richardson had nine recoveries in thirty-two cases (*i.e.*, seventy-five per cent.

¹ Medical News, January 5, 1895.

² Lectures on Appendicitis, New York, 1895, p. 81.

³ Medical Record, February 15, 1895.

⁴ Medical Record, March 30, 1895.

⁵ Ibid., February 9, 1896.

mortality); Mikulicz had two recoveries in eleven cases; Sonnenburg no recoveries in thirteen cases.

It is, at least in America, recognized that there is scarcely any danger in an early laparotomy. It is pertinent, therefore, to ask, *whether the death-rate would increase or diminish if every case were operated on as soon as diagnosed.* White¹ believes that by surgical treatment in all early cases there would be an extremely low mortality, but not that it would be practically nothing. Hawkins² considers the claims of surgeons fairly,—with greater fairness than I have found elsewhere. In regard to the claims of surgeons, that by early operation many lives will be saved, he acknowledges that thirteen per cent. of all cases develop diffuse peritonitis; but in order to save these thirteen lives one hundred successful laparotomies must be performed, which he scarcely considers probable. We meet, besides, certain forms with large perforations, accompanied by the passage of fecal matter and bacteria into the abdomen, and he doubts that operation would be of any avail in such cases, although there is good reason to believe that those cases of diffuse peritonitis which commence as a local form, and those cases which, commencing mildly, suddenly collapse and die on the fourth or fifth day from lymphangitis, would recover by operation. He thinks, therefore, that by early routine operation some lives might be saved, but not enough to counterbalance the disadvantage of such wholesale surgery. He forgets, however, that the diagnosis of the severe cases, as I have already pointed out, is not so difficult as supposed; that there are certain serious symptoms, particularly the severe pain, the muscular rigidity, the lack of improvement inside of twenty-four or thirty-six hours,

¹ Loc. cit.

² Loc. cit., p. 128.

and the condition of the pulse, which ought to put the physician on his guard and have his thirteen patients operated on before it is too late. With those safely disposed of, the question is how great the mortality would be in eighty-seven simple, uncomplicated, early laparotomies. All competent surgeons agree that in these cases the mortality is very small, scarcely more than in the quiescent period. In regard to the claim of surgeons that much suffering will be avoided by the prevention of future attacks, he concludes that if all his relapsing cases (fifty-nine in all) had been operated on after the first attack seven lives would have been saved and fifty-two other individuals would have been spared a more or less severe illness, provided these fifty-nine early laparotomies had terminated favorably, which he, in this case, considers probable. *The logical conclusion*, therefore, it seems to me, is that under medical treatment those cases (about eighty per cent.) will recover which simply suffer from mild attacks, and for that matter need no other treatment than rest in bed, diet, and perhaps a little opium, while the serious cases, with gangrene and perforation with diffuse peritonitis, almost invariably will die, and that a certain percentage of those with localized abscesses will recover by perforation into the bowels, but independently of the medical treatment used. "No purely medical treatment of actual value in preventing or controlling the disease has yet been presented to the profession."¹ Under surgical treatment the perforative cases have a fair chance of recovery, the chance depending absolutely on the time of operation and being less and less for each day the operation is put off. The cases with localized

¹ McBurney, Dennis's System of Surgery, vol. iv. p. 415, New York, 1896.

abscess recover almost invariably by early operation; the chronic recurring cases in the quiescent period have no mortality worth mentioning; the mild cases may show a certain mortality by operation, but it will at least be very small and by far counterbalance the fatal cases and the sufferings which will result from recurring attacks in the eighty per cent. which recovered apparently after medical treatment.

Under medical treatment there is a sure mortality of probably sixteen per cent., more or less; under surgical treatment there may be a small mortality, probably less than four per cent. in early operations, and then in cases with primary large perforations, while relapses are impossible. The relapses in the apparently recovered eighty per cent. of medical cases will during the next few years probably bring the mortality higher than sixteen per cent., not counting the suffering and the loss of time dependent upon these relapses.

“Whatever we do, the responsibility is considerable at best, but the responsibility is a hundred-fold greater when we advise delay in resorting to operation.”¹ “To be positive in regard to many points of the utmost importance we must wait. If we wait long enough, say to the seventh or ninth day, many of these difficult questions will be solved, for one after another of our patients will have died and one after another of our questions will have been answered.”² One question, however, has not been settled, although of the greatest importance, both in regard to prognosis and treatment,—viz., *whether complete recovery occurs after a bona fide attack of appendicitis*. Prof. With³ stated that seventy per cent. never get more than

¹ Rushmore, *Annals of Surgery*, October, 1896.

² McBurney, *Annals of Surgery*, April, 1891, p. 243.

³ *Forhandlinger of Kjöbenhavns Med. Selskab*, 20 Januar, 1891

one attack; Hawkins¹ had fifty-nine relapses in two hundred and fifty cases,—*i.e.*, twenty-three and six-tenths per cent.; Fitz² had forty-four per cent. relapses; I have had forty-seven per cent. relapses.

Porter³ says that, taking all the facts as given on the subject of recurrence, we “must conclude that the large majority of cases are solitary, though we are not warranted in making a positive statement as to the exact percentage.” It must, however, be remembered that very mild forms of appendicitis may be overlooked or forgotten by the patients, although they may leave behind pathological changes which directly may lead to relapses; neither is it probable, with our present knowledge of the etiology and pathology of appendicitis, that the disease would start spontaneously. My personal opinion (and it is shared by a great many distinguished surgeons) is that perfect recovery, except after obliteration or destruction of the appendix, never occurs except, perhaps, in the earliest and mildest forms, which cannot be diagnosed clinically, but that strictures, with subsequent retention of secretion and formation of concrements, dilatations, infiltration, stiffness of the organ, deformities, and adhesions, will be found as the result of every tolerably acute attack, and that these pathological conditions form the predisposing cause to new attacks, the intensity of which again depends upon the presence of pyogenic microbes. The frequency with which we, by Edebohls’s method of palpation, find thickened, stiff, and tender appendices in people who formerly have had one or more attacks of even mild appendicitis, speaks against the occurrence of perfect recovery. So does the frequency

¹ Loc. cit., p. 112.

² Boston Medical and Surgical Journal, June 19, 1890, p. 620.

³ American Journal of the Medical Sciences, 1893, p. 650.

with which pathological lesions are found at autopsies. I am convinced that we may show after every acute attack of appendicitis that the appendix is no longer normal, but in a more or less pathological condition and inclined to be attacked again, an attack which perhaps may be slight and disappear again, but which also may be one of the most serious ones, with gangrene, perforation, and diffuse septic peritonitis. Willy Meyer¹ holds that an appendix which has been inflamed once, seriously or mildly, must be looked upon as a diseased organ which is apt to give rise to serious trouble at some time in the future, and, therefore, as a prophylactic measure, should be removed after the first attack. He is convinced that not twenty nor even ten of them will be found to remain healthy. McBurney² has no doubt that the large majority continue to suffer after an apparent recovery and present symptoms of a chronic appendicitis. Prof. Dieulafoy³ takes virtually the same position, when he states that in all cases of appendicitis there is obliteration of the appendicular canal, and that the appendix is converted into a closed sac. Sonnenburg⁴ warns against laying too much weight on physicians' statements about spontaneous cures or on their published statements about the percentage of recoveries, as they give no information about relapses. We operate often on cases which were discharged from medical wards as recovered from the first attack.

Spontaneous cure may occur by obliteration of the appendix, or after perforation of an abscess and destruction of the appendix, and in rare cases by absorption or

¹ Medical Record, February 29, 1896.

² Annals of Surgery, June, 1896.

³ Report of the Meeting of the Academy of Medicine in Paris, March 10, 1896.

⁴ Deutsche Zeitschrift für Chirurgie, 1891, Band xxxviii. p. 163.

incapsulation of a small abscess, but relapse will occur, if the spontaneous cure is imperfect, after months or years,—even after twenty years. Deaver¹ says that the proportion of persons who have but one attack and remain perfectly healthy after its subsidence is so infinitely small compared with those who have repeated attacks with an interval of invalidism, that, where practicable, all cases of appendicitis should be operated on as soon as the diagnosis has been established. Helferich,² of Greifswald, believes that smaller abscesses may become reabsorbed or encapsulated, but that this does not constitute a perfect recovery unless obliteration of the appendix or *restitutio ad integrum* occur.

Krafft³ thinks resolution impossible, and believes there is always a pus focus left which, on slight provocation, may start the inflammation again. Max Schede⁴ says that relapses are frequent in the simple acute forms, and that eventually the more severe forms will occur. Lennander⁵ met relapses in every case, when observed long enough, in which resistance and tenderness continued in spite of medical treatment. White⁶ refers to the statement of Fitz, that, while a simple catarrhal appendicitis may exist anatomically, it is doubtful whether its clinical appreciation is possible. The same symptoms that indicate a slight catarrhal appendicitis from mechanical obstruction—*i.e.*, colicky pains, local tenderness, moderate fever, rigidity, and vomiting—may be found in cases which

¹ Loc. cit., p. 123.

² Die Pathologie und Therapie der Typhlitiden, see Verhandlungen des 13 Congresses für Innere Medicin, München, 1895, p. 246.

³ Volkmann's Klinische Vorträge, January, 1889.

⁴ Die Chirurgische Behandlung der Perityphlitis, Deutsche Med. Wochenschrift, No. 23, 1892.

⁵ Loc. cit., p. 42.

⁶ Loc. cit.

are going on to rapid termination by gangrene, perforation, and septic peritonitis.

"It must, therefore, be decided," White states, "whether medical treatment or operation offers the best chance for recovery in these cases, and in reaching this decision it is impossible to ignore the oft-repeated assertion, that all cases are essentially infectious, and that recovery from any particular attack is, as a rule, only apparent and temporary, not real or permanent." Hawkins,¹ although a strong conservative, thinks that every patient who once has had an attack of perityphlitis is liable to a second attack as long as his appendix remains unobliterated or until it is removed. I might multiply these statements, but I consider the references mentioned sufficient to prove the doubt about perfect recovery after an acute attack which is held by those best able to judge,—the operating surgeons.

TREATMENT.

I have in the preceding pages stated my opinion, based upon different statistics, that strict medical treatment has a mortality primarily of probably twenty per cent., and that about eighty per cent. recover. I have also expressed my doubt, shared by many surgeons, that all these recoveries are real. They are subject to the same rules as other cases, and will probably be followed by relapses in twenty-five to fifty per cent., of which a certain number will die during the second attack, another portion during the third attack, etc., bringing the mortality of a given one hundred cases under medical treatment considerably higher than twenty per cent. I have also shown that by early operative treatment the twenty per cent. fatal cases under medical treatment will recover, save possibly a few

¹ Loc. cit., p. 111.

in which there is a large perforation in direct communication with the cæcum, and that the result depends upon the time of operation, the danger and the mortality increasing with each day the operation is delayed. If the eighty per cent. of apparently recovered cases were submitted to operation, either during the mild attack or else after recovery or in the quiescent period, there is scarcely any doubt that the mortality, in the hands of a careful and conscientious surgeon, would be, if not nothing, next to nothing, leaving the mortality under surgical treatment probably less than five per cent., with no chance of relapses in the remaining cases. With these statistics in view it is of interest in the following pages to review the opinions of prominent physicians and surgeons in different countries and thereafter to consider the medical and surgical treatment proper.

In **England** we find still rather conservative ideas prevailing, supported principally on the strong protests of Treves¹ against wholesale operations in all cases of typhilitis, even if they are distinctly acute, as the majority terminate in recovery under medical treatment. He considers surgical treatment called for only in comparatively few, selected cases, and even in these it is possible to clamor for too early operation. "The almost reckless and injudicious manner in which the appendix is being excised at the present day is doing a great deal to bring the operation into discredit." Treves has confined himself almost exclusively to operations in the quiescent period, he having performed thirty-two operations with one death, this not being due to peritonitis. In 1893 Kelynack,² speaking from a pathologist's point of view,

¹ Lancet, February 21, 1891.

² Contribution to the Pathology of the Vermiform Appendix, London, 1893, p. 157.

acknowledges that in certain forms of appendicitis operation is the only measure that can avert a fatal termination :

1. All cases of acute perforative appendicitis with diffuse peritonitis. Here laparotomy gives the only chance, and the earlier it is performed the better.

2. Cases of perforative appendicitis with localized abscess, as there is the possibility of sudden irruption into the peritoneal cavity with fatal results.

3. In rapidly progressing cases, quickly leading to gangrene, in order to forestall the perforation.

4. In cases of recurrent or relapsing appendicitis where the attacks are so severe or so frequent as seriously to interfere with the duties of the patient.

One wonders which cases he would leave to medical treatment and what he means when he says,¹ "that the all-important practical classification must ever be (1) operative appendicitis and (2) non-operative appendicitis."

Hawkins,² in 1895, tried honestly and fairly to solve the difficult question by the aid of statistics, working, however, with small numbers. His conclusions from two hundred and sixty-four patients are that if all his relapsing cases (fifty-nine in all) had been operated on during or immediately after the first attack seven lives would have been saved and fifty-two other individuals would have been spared a more or less severe illness, provided, of course, that these fifty-nine early laparotomies had terminated favorably. "If, however, the mortality of the operations is so small that it may be neglected, and if I am wrong in doubting its efficacy in

¹ Loc. cit., p. 159.

² Diseases of the Vermiform Appendix, London, 1895.

preventing fatal peritonitis, it must then be admitted that excision in the first two days of illness is the true and rational plan of treatment." Hawkins, I believe, makes one great mistake in considering seventy-eight per cent. perfectly recovered. Many of them will, without doubt, suffer relapses, increasing his mortality considerably.

He bases his opinion, as stated, on two hundred and sixty-four cases from St. Thomas's Hospital with a mortality of fourteen per cent.¹ This mortality agrees well with Prof. With's and Dr. Floystrup's mortality of respectively sixteen and fifteen and four-tenths per cent. under exclusive opium treatment, as operations were confined to opening thirty-three cases of abscess, making laparotomy in eleven cases of diffuse peritonitis, all of which died, besides removing the appendix in one case of simple perityphlitis without pus. One hundred and ninety of the two hundred and sixty-four cases had simple adhesive appendicitis limited to the right iliac region and not progressing to the formation of pus. They all recovered, and counting these cases is what makes the mortality so low,—*i.e.*, fourteen per cent. These cases would recover under any treatment, medical or surgical. It is, however, a question—and a very important one—in how many cases the recovery was perfect and permanent. Forty-five of these one hundred and ninety cases —*i.e.*, twenty-four per cent.—had had one or more previous attacks; but, nevertheless, the recovery was perfect! In thirty-eight cases the disease progressed to formation of pus, ten of which died,—*i.e.*, twenty-six per cent. mortality. Seven had had previous attacks, four of which died. This is a very high mortality, and does not com-

¹ Loc. cit., p. 127.

pare at all favorably with the results obtained by American surgeons in this class of cases.

Diffuse peritonitis was present in thirty-eight cases, in four of which the peritonitis was localized at first, and the mortality was twenty-seven,—*i.e.*, seventy-seven per cent.; seven had had previous attacks, of which four died. Taking all his cases together in which there was formation of pus, localized or diffused, we find a mortality of thirty-seven in seventy-four cases,—*i.e.*, fifty per cent.; and we may, perhaps, take Hawkins at his word and consider this the result “of allowing the disease to take its natural course.” While he is conservative in the acute and perforative cases, in spite of his conclusions, he is in favor of excising the appendix in the quiescent period, and considers it a better method than excision during the first attack, although acknowledging the difficulty in arriving at a definite practice, “as no man by any known symptom can prophesy as to the occurrence of future attacks.” It may be accepted, he states, that the odds against a subsequent attack are as three to one (Fitz says five to two), and the odds against its terminating fatally as seven to one. He thinks it, therefore, the duty of the physician to advise the removal of the appendix after the first attack, on the ground of preventing the slight loss of life and the immense waste of time that is associated with a recurrence of attacks.¹

It is rather discouraging, after the clear and comprehensive pathological exposition in the works of Kelynack and Hawkins, to turn to the addresses in medicine and surgery at the recent meeting of the British Medical Association, at Carlisle, July 28, 1896.² Sir Dyce Duck-

¹ Loc. cit., p. 132.

² British Medical Journal, August 1, 1896, pp. 255 and 262.

worth, in his address in medicine, states that many cases recover under judicious medical treatment; that a perityphlitic abscess, if opened carefully about the ninth or tenth day and without contaminating the peritoneal cavity, will generally heal favorably; that earlier surgical interference is very apt to lead to a fatal issue by toxic peritonitis; and that only a gangrenous state of the appendix, if diagnosed early, demands an early operation. Dr. MacLaren, delivering the address in surgery, expresses probably the conservative English opinion, that only after repeated attacks and failure of careful dieting are we justified in resorting to a preventive operation. The great majority of attacks, he argues, are not repeated, everything clears up after one attack, perforation occurs in most instances in the first attack, and one attack does not increase the probability of perforation in recurrence. The time for preventive operation comes after relapse, not after the first attack, and it is then devoid of danger and absolutely effective. The discussion, however, showed that English surgeons are commencing to distrust the conservative treatment advocated by Treves and other leading men. Mr. Rutherford Morison, for instance, would operate after the second attack in cases of abscess, in cases of perforation, and in cases with sudden onset of urgent symptoms in quiescent cases. Mr. Morton, of Bristol, would operate in every severe case, for fear of peritonitis. Mr. Verrall, in comparing Hawkins's statistics with those of Murphy, of Chicago, thought that early operation lowered the mortality and saved time and pain.

Germany.—I have in a previous section referred to Renvers's statistics of two thousand cases from the German army, with ninety-six per cent. of recoveries, and to Vollert's report, from Nothnagel's clinic in Vienna, of sixty-five cases, with ninety-five and four-tenths per cent.

of recoveries, and shown that these statistics are of no value, as they largely consist of typhlitis stercoralis, give no idea about relapses, and are completely at variance with the results of medical treatment from all other sources. It is with pleasure, therefore, that one turns to Sonnenburg's¹ statistics and finds exactly the same results of surgical treatment and the same arguments for its use, perhaps even stronger expressed than by other authors, American not excepted.

Of seventy-seven operations, five were performed for simple appendicitis without perforation,—*i.e.*, empyema,—and all recovered. Fifty-two operations were performed on account of perforation with local abscess, and all were successful. Of eight cases in which there were complications, such as multiple abscesses, progressive fibro-purulent peritonitis, etc., five recovered and three died, and, lastly, of thirteen operations for diffuse septic peritonitis all died. Sonnenburg's conclusions are, that the final outcome of appendicitis cannot be prophesied; that early surgical treatment not only is justified but alone is able to produce definite recovery and prevent relapses; that early operation gives the best result, fifty-seven such cases all recovering; that perforating appendicitis, which we are able to diagnose clinically, gives the indication to operation, and that the belief that perforative forms may heal spontaneously is fallacious and not proved in fact. We have no knowledge of the clinical features during life in such cases in which spontaneous recovery has been found at autopsies. For instance, all Finkelstein's cases, save one, were those of simple appendicitis. "Surgery alone is able by early evacuation of pus, which always is present in suppurating appendicitis, to prevent the fur-

¹ Deutsche Zeitschrift für Chirurgie, Band xxxviii. p. 285.

ther dangerous progress of the disease and bring on final recovery, which by expectant treatment is left to accident. The treatment of perityphlitis, therefore, belongs to surgery. The disease will then lose its dangerous character. It is not in our power to bring on spontaneous recovery, even if it may come by shrinking and obliteration of the appendix. We have let the opportunity of an operation slip, if recovery is imperfect, and we let the patients walk around with a chronic affection which at any moment may change into an acute, fatal, universal peritonitis."

In his latest work¹ Sonnenburg publishes one hundred and thirty operated cases. Primary typhlitis was not found in a single case, and with the exception of one case the inflammation started in the appendix even in those cases in which all the symptoms of typhlitis stercoralis, particularly the early appearing tumor, were present. Seventeen cases were operated on for simple appendicitis, acute, chronic, or purulent-catarrhal, and all recovered. These are cases in which there is neither ulceration nor gangrene present, but catarrh or empyema with adhesive peritonitis, strictures, bends, etc. While he acknowledges that these cases may heal spontaneously, he states that they have an inclination to relapse, proving that the inflammatory process is progressive and may lead to perforation. Perforative appendicitis presupposes a previous appendicitis simplex. Of perforative appendicitis with local abscess, but without complications, he operated on seventy-four cases; all recovered. Less than half, thirty cases, were operated during the first week, twenty-six in the second week, and eighteen still later. Only one case was operated on on the second day, three on the third, eleven on the fourth, nine on the fifth, three on the

¹ Pathologie und Therapie der Perityphlitis, Leipzig, 1895.

sixth, and three on the seventh day. Of perforative appendicitis with complications, such as multiple abscesses, progressive fibro-purulent peritonitis, pylephlebitis, pleurisy, empyema, thrombosis of iliac vein, abscess of liver, and sepsis, he had twenty-two cases, of which twelve died,—*i.e.*, fifty-five per cent. mortality. Lastly, fifteen cases which entered with perforation and septic peritonitis all died. Volkmann¹ says that typhlitis and perityphlitis are diseases that should be treated exclusively by surgeons. An incision that does not meet pus does no harm, and recoveries from large abscesses and exudations under medical treatment lose their value on account of the frequency of relapses, which often terminate fatally. Kummel² advises in chronic cases operation after the second attack; he had twenty-four such operations, all successful. Max Schede³ reported in 1892 eighteen operative cases; Krafft, Lange, Körte, Küster, Mikulicz, Finkelshtein, Von Bergmann, Helferich, and many others have written on the subject and advanced our knowledge, particularly of the pathology.

France.—Of the more modern authors Paulier⁴ is the first to call attention to early incision as advocated by Gouley and Parker, “which has perhaps been neglected in France.” The treatment advocated is the antiphlogistic of the Broussais school, with purgatives, baths, leeches,—of which one hundred and fifty were applied on one patient and two hundred and fifty on another,—mercurial inunctions, and poultices. His mortality was really less than could be expected after this treatment. In his forty-

¹ Deutsche Med. Wochenschrift, 1889, No. 36, p. 753.

² Deutsche Med. Wochenschrift, 31, 1894, p. 628.

³ Deutsche Med. Wochenschrift, 23, 1892.

⁴ Contribution à l'Etude de la Typhlite et de la Pérityphlite, Paris, 1875.

nine cases there was a mortality of thirty-three per cent., but of eighteen cases with diffuse peritonitis fifteen died, —*i.e.*, eighty-three per cent. We hear little about operative treatment till Tuffier's¹ article appeared. It is a comparative investigation into the claims for surgical treatment, based, however, upon statistics of foreign authors, he himself having seen only five recent cases, none of which were operated, although he "many times has been at the point of interfering surgically."

Emile Maurin's² work appeared the same year (1890), and he also states that this affection has been somewhat neglected in France. He reports very interesting statistics of one hundred and thirty-six cases, in which the appendix was the point affected ninety-four times, the cæcum, thirty-six times, and both six times. Of the ninety-four cases seventy-eight were males, sixteen females. Sixty-six had perforation, eleven simple gangrene, eight gangrene and perforation, five ulceration or cystic dilatation. Eighty developed peritonitis, of which forty-eight had diffuse peritonitis, nine localized abscesses, eleven localized abscesses perforating and producing peritonitis, four extraperitoneal abscesses, etc. The mortality was enormous, all dying but four,—*i.e.*, ninety-six per cent. mortality. Eighty-one died without operation, ten after operation,—four incisions and six laparotomies. Three recovered spontaneously after opium treatment, one after incision; forty-one per cent. died in the first six days. The treatment in the ninety fatal cases was still the anti-phlogistic. Broussais's recommendation of leeches and bleedings, as used by Louyer-Willermay and Mélier, was, however, discarded. They used thirty leeches the

¹ De l'Intervention chirurgicale dans les Pérityphlites, Archives générales de Médecine, September, 1890.

² Essai sur l'Appendiculite et la Péritonite appendiculaire, Paris, 1890.

first day, forty the second day, fifty the third day, not counting during the same time two or three bloodlettings of four hundred or five hundred grammes each. Repeated administrations of purgatives were, however, used. Maurin objects to purgatives and recommends opium, calling particular attention to Prof. With's statistics as proof of its effect. "We try to fight the constipation which so often accompanies the disease, and forget that it, whether cause or effect of the disease, has a beneficial effect which we ought to favor. The great danger is to transform a partial, localized peritonitis into a general peritonitis." The four patients who recovered were treated with opium. If, however, opium does not arrest the morbid process, and if this shows no inclination to recede, or, still more, if it continues to advance, resource must be had to operation, in perityphlitic abscess by extraperitoneal operation from the tenth to the twelfth day, in localized peritonitis by laparotomy, and in diffuse peritonitis by incision in the median line. "In these last cases we come often too late by delaying the operation twenty-four or forty-eight hours."

The most important work which I have come across is Charles Talamon's book.¹ Although over four years old, it gives some pretty clear indications for operative treatment; but he considers those cases in which the inflammation is limited to the walls of the appendix, or in which the peritoneal affection is simply adhesive, as indisputably medical, although even then he considers the indications to have but a relative value. "The only absolute rule that can be given is the following: The moment the diagnosis of acute, perforative appendicitis with generalized peritonitis is made, or of appendicitis

¹ Appendicite et Pérityphlite, Paris, 1892.

with periappendicular suppuration, that moment it is time to abandon all medical treatment and summon the surgeon and let the responsibility of a laparotomy rest with him." "Theoretically,¹ surgical interference is indicated as soon as the diagnosis of perforative appendicitis is made. Practically, this interference should be immediate in cases of general peritonitis at the onset, from the eighth to the twelfth day in circumscribed abscesses, and in the quiescent state between two attacks in relapsing cases. In all other cases medical treatment ought alone to be employed, an operation made under pretext of preventing perforation being unjustifiable, considering the enormous proportion of cases which get well without the help of the bistoury. Physicians, however, should know when to summon the surgeon; the surgeon, when to operate and when not to operate." One cannot help pitying the French surgeon, on whom "the responsibility of laparotomy must rest." Talamon, evidently, does not write from personal experience, has not made up his mind what to do, and furnishes no statistics of operated cases. Theoretically operation is indicated when the diagnosis of perforative appendicitis is made, but practically we ought to procrastinate except in the necessarily fatal cases! The result can only be the same as under exclusive medical treatment. The only French surgeon I have come across who considers appendicitis a surgical lesion is Terrier.² He reports three cases, one acute, who died after operation on the sixth day, and two chronic, who recovered. He considers appendicitis a septic lesion in three-fourths of all cases, or that it may become so the very next day, and that we ought, therefore, to operate.

¹ Loc. cit., p. 200.

² Traitement de l'Appendicite, *Le Mercredi Médical*, June 15, 1892, p. 231.

Sweden.—The foremost advocate of operative treatment in the Scandinavian countries is undoubtedly Prof. Lennander in Upsala, whose work,¹ however, is more a description of, and a deduction from, sixty-eight operated cases. He advises rest in bed, absolute diet, ice locally, and opium in sufficient doses to relieve pain and keep the patient quiet. He believes that by this treatment not only serious complications can be prevented, but that perfect recovery may occur, even in chronic cases, “provided that there are no particular chronic changes in or around the appendix which make recovery impossible.” This advice, however, is purely theoretical, and he gives no statistics to prove his assertion. Practically he operates upon his cases just as soon as he gets them,—upon some of them during the first two or three days after the commencement of the attack,—and the earlier the operation the better the result and the quicker the recovery. He operates during the attack:

First. When the attack is so severe that diffuse peritonitis is threatening or perhaps already present. This indication he considers absolute.

Second. In lighter forms, when improvement does not occur in spite of vigorous medical treatment, particularly when secondary ileus, dependent upon paralysis of the bowels or upon adhesions from fresh exudates, is present. He warns against delaying operations in these cases until fecal vomiting and a small, quick pulse are present.

Third. He operates in relapsing cases when the attacks occur frequently, even if not severe, when the last or the later attacks become more severe, and when after an attack a tumor or swelling, particularly if tender to pressure, continues in spite of medical treatment. This

¹ Ueber Appendicitis, Wien, 1895.

last indication he considers absolute, as "all the patients he has had under observation for a sufficient time have got relapses." This last statement seems to contradict his former statement that perfect recovery may occur even in chronic cases, and I believe that he will come to the same conclusion as I myself: that perfect recovery rarely, if ever, occurs after a moderately severe attack, but that pathological changes are left behind in the appendix in the form of strictures, adhesions, cystic dilatations, bends, etc., which predispose to a new attack. His indications, it will be seen, differ not in the least from those of the most progressive American surgeons, and his results in the sixty-eight cases are exactly what we would expect to find,—a very small mortality in early laparotomies for suppurative cases (sixteen recoveries and one death from volvulus), the same in incision for localized abscesses (fourteen recoveries and one death from pyæmia operated on the forty-second day), sixty per cent. mortality in cases of diffuse peritonitis, no deaths in twenty-one cases of chronic appendicitis, and, lastly, in nine cases of gangrene, with progressive fibro-purulent peritonitis but without perforation, eight recoveries and one death, after operation *in extremis*.

Denmark.—Since Prof. With's classical treatise in 1879 no work has appeared in Denmark except Dr. Floystrup's¹ book in 1888, and it is of historical interest as showing the opinions which were held nine years ago. He reported in his book one hundred and fifty-six cases, of which twenty-four died,—*i.e.*, fifteen and four-tenths per cent. mortality. They were all treated exclusively with opium. The fatal result was due in thirteen cases to primary diffuse peritonitis, in eight cases to circum-

¹ Perityphylitis og dens Behandling Kjöbenhavn, 1888.

scribed abscesses perforating later into the peritoneal cavity, and in three cases to retroperitoneal abscesses. Retroperitoneal abscesses only were considered proper for operation, and of the one hundred and fifty-six cases only four, all with retroperitoneal abscesses, were operated upon.¹ The arguments against operative treatment in cases with diffuse peritonitis were, that in the majority of cases it is impossible to diagnose the point of perforation or the primary affection, and that we therefore are forced to be satisfied with the constipating method, "which is not quite hopeless." In circumscribed abscesses it was supposed to be quite impossible to find small abscesses, and even the larger ones were not easily diagnosed. We would, besides, by laparotomy run the risk of loosening the fresh adhesions and making the peritonitis diffuse. There would, therefore, only rarely be indication for operative treatment. The extraperitoneal abscesses, however, were less dangerous to operate and the diagnosis easier, except when they started in the folds of the mesentery, in which case they could neither be diagnosed nor treated surgically. There would, therefore, relatively rarely be occasion to operate for perityphlitis, partly on account of the difficulty of the diagnosis, partly on account of the dangers of the operation. The late lamented Dr. Iversen read a paper in the Copenhagen Medical Society on appendicitis on January 20, 1891, in which he particularly called attention to the septic lymphangitis. He advised (1) extirpation in the quiescent period, of which he reported a few successful cases, (2) incision of abscesses without removal of the appendix, and (3) not to operate cases with acute septic peritonitis from perforation. This is all of recent Danish contribu-

¹ Loc. cit., pp. 49-51.

tion to the subject which has come to my notice, with the exception of Dr. L. Kraft's article on "Appendix Vermicularis i Brok," in *Nordisk Medicinsk Archiv*, 1894, Heft 4.

United States of North America.—In America we find the opinion prevalent that the appendix ought to be removed as soon as the diagnosis is made. It would be impossible to mention and review the enormous literature which has grown up during the last four or five years, and I shall therefore mention only the more important contributions. The arguments for early operation in general are that we are unable in a given case to tell what the result will be; that an early laparotomy under proper precautions is almost devoid of danger; that perforation is often present from the start, and that relapses are avoided. McBurney,¹ who more or less is the father of early laparotomy, considers it far more important for us to know when that pathological process begins which directly causes the deaths on the third, fourth, and fifth day! He thinks it safe to say that in a very large majority of the cases dying within the first five days the fatal sepsis, hopeless for medicine and nearly hopeless for surgery, begins before the end of the third day. It is not best to wait for strong evidence of perforation, abscess, or general peritonitis. When we discover spreading peritonitis, peritonitis has already spread. No one can name the signs of impending perforation, and we should endeavor to anticipate the bad symptoms. The question of operation should therefore be deliberately and carefully discussed, and the operation performed in all the cases which after the end of thirty-six hours show well-marked signs of increasing disease.

¹ *Annals of Surgery*, April, 1891, p. 243.

Prof. W. W. Keen,¹ of Jefferson Medical College, lays it down as a rule that even in mild cases that are apparently convalescing, if the indications point even slightly towards pus, an early operation should be done. If pus is present the propriety will be denied by no one, and if absent a simple exploratory operation with all the precautions of modern antiseptic surgery is so far from being dangerous that no patient should be allowed to run the risk of a probable or possible rupture and general peritonitis, as an exploratory operation carries with it less danger than the disease. He advises, as a rule, operation on the second day, or certainly on the third, (1) if there is abdominal pain, most marked in the right iliac region, with tenderness at McBurney's point, attended with nausea and vomiting; (2) if there is rigidity of right abdominal wall; (3) if the temperature is from 100° to 102° F.; (4) if tumefaction with increased resistance can be felt; and (5) if there is œdema of the abdominal wall. "The first indication is to call a surgeon."

G. R. Fowler² states that the prognosis, in his judgment, is always uncertain in cases in which no operative interference is instituted, and favorable only in cases which are neither progressive nor stationary, but, on the contrary, retrogressive within the first twenty-four hours of attack. The great majority of cases should be treated surgically. "As soon as the diagnosis of progressive appendicitis is assured, the abdominal cavity should be opened and the appendix removed. If opium has been injudiciously administered, and the progressive character of the case in hand is doubtful, it is better to err on the side of safety, and remove the appendix at once. To operate too early

¹ *Annals of Surgery*, April, 1891, pp. 259 and 262.

² *Observations on Appendicitis*, *Annals of Surgery*, March, 1894.

may be to operate unnecessarily, but this is always preferable to operating too late and hence unsuccessfully."

Prof. J. W. White,¹ of the University of Pennsylvania, believes few, if any, surgeons would dissent from the following rules for indication to operation, which he considers indisputable:

Immediate operation when the onset is marked by suddenness and severity.

Whenever, even in a mild attack, the symptoms at the end of forty-eight hours are unrelieved or growing worse.

Whenever, in cases seen later, a firm, slowly-forming, well-defined mass is felt in the right iliac region.

Whenever sudden increase of pain and rapid diffusion of tenderness occur.

Whenever there is reason for considering the appendicitis tubercular in character.

Whenever attacks of any type have been numerous, *or* are increasing in number and gravity, *or* have unfitted the patient for work and activity, *or* have caused local, permanent, and consistent symptoms, *or* have at any time put the patient's life in great danger.

If the symptoms get worse, instead of better, at the end of forty-eight hours or earlier, operate at once, as these symptoms indicate perforation, and as there is absolutely no way of recognizing which of the following three events will occur: resolution with recovery, localized abscess with ninety or ninety-five per cent. of chances in the patient's favor, or general peritonitis with almost sure death. J. B. Murphy,² of Chicago, says the operation should be performed as soon as a diagnosis is made, as

¹ University Medical Magazine, March, 1896, and Address on Appendicitis, Therapeutic Gazette, June 15, 1894; see also editorial article in Annals of Surgery, June, 1896.

² Medical News, January 5, 1895.

we cannot differentiate in the early stages which cases are going to be favorable, and as the earlier the operation the less the danger and the easier the removal.

J. A. Wyeth¹ expresses as his opinion that, if all of a thousand suspected cases were operated upon, the mortality would probably be fifty per cent. less than in another thousand cases treated conservatively without operation, and that the rate of perfect recovery under so-called conservative treatment would be about fifteen in every hundred, excluding those which get relapses after an acute attack. In the light of further experience he declares that, if the error of operating on every suspected case of appendicitis were made, and the operation performed by a surgeon who knows what practical asepsis and careful technique are, the mortality would not be five per cent. He looks upon appendicitis as a strictly surgical lesion, and believes that cases which are cured without operation are either mild in type, with a gradual and limited infection and with a copious plastic exudate, which subsequently may be absorbed after restoration of the canal, or else recover as the result of a blind chance in the formation of adhesions strong enough to protect the peritoneal cavity till the abscess breaks through somewhere else. These last cases are accompanied by great danger to life and future usefulness, all of which may be prevented by early operating. Deaver² believes that there is but one course to pursue in order to obtain the best possible result,—*i.e.*, to remove the appendix as soon as the diagnosis has been made. Appendicitis is a surgical affection and should be treated as such. We cannot foretell, with even the slightest amount of assurance, the issue

¹ Medical Record, November 26, 1892, and May 9, 1896.

² A Treatise on Appendicitis, Philadelphia, 1896, pp. 116 and 122.

of any attack of appendicitis. The main point to consider, then, is: shall we risk the patient's life or shall we accept the only alternative and remove the organ in its incipient stage? Such an operation is a conservative and not a radical operation. Willy Meyer¹ says, "In cases of doubt the operation is generally safer than waiting, provided the patient is still in the early days of the attack."

I might continue to make similar extracts from the writings of scores of prominent American surgeons, with the same result, that the appendix should be removed early, unless the case shows great improvement and abatement of the serious symptoms inside of twenty-four or forty-eight hours. *Where surgeons differ* is in regard to the proper treatment of acute cases seen from the third to the sixth day. Shall these cases, which Richardson,² of Boston, described as "too late for an early operation and too early for a late operation," be operated early, with the risk of infecting the general peritoneal cavity, or operations be delayed till the circumscribing wall is stronger, with the risk of spontaneous perforation of the abscess into the peritoneal cavity, and, finally, shall we remove the appendix or simply open and drain the abscess?

The question is not whether it is preferable to remove the appendix in all cases or treat the patients medically, but whether removal in all cases is preferable or not to the more conservative and less dangerous method of simply incising and draining the abscess with perhaps subsequent removal of the appendix by a secondary operation if necessary. White³ does not consider this question settled, although he believes operation is certainly indicated whenever a firm, slowly-forming, well-defined

¹ Medical Record, February 29, 1896.

² American Journal of the Medical Sciences, January, 1894.

³ Therapeutic Gazette, June 15, 1894, pp. 34, 54.

mass is felt in the iliac region or when a sudden increase of pain and tenderness points to perforation. He considers it, however, poor surgery in every case and at every period to insist upon finding and removing the appendix in the face of obstacles. Richardson¹ thinks incision and drainage of abscesses sufficient, and considers it extremely dangerous to break down the barriers between an appendicular abscess and the rest of the peritoneal cavity in order to remove the appendix. McBurney² believes a reasonable effort should be made in every case to find and remove the appendix. He looks upon every case of suppurative disease of the appendix as being ripe for an operation as soon as the diagnosis is made. He would never wait two or three days in order that the abscess may come nearer to the anterior abdominal wall, because serious accidents might happen while one is waiting. Every case should be dealt with according to conditions present. If the abscess be three days old it should be handled in one way; if ten days old it must be managed in another way. In one case the appendix should be left alone, because it would be dangerous to take it out; in another it should be taken out, because it can be done without additional risk to the patient. Almost all the serious obstacles to complete and safe operation depend upon delay in operating. W. T. Bull,³ of New York Hospital, advises the removal of the appendix if readily found and easily separated from the adhesions. He does not attempt to remove it in cases operated upon later than the seventh or tenth day, the more so as only a small proportion of cases suffer relapses or fistulas, both

¹ American Journal of the Medical Sciences, January, 1894.

² Annals of Surgery, June, 1896, p. 752.

³ Annals of Surgery, June, 1896, p. 764.

of which may be operated on secondarily. N. Senn,¹ of Chicago, takes the same view and simply incises and drains in cases of large abscesses. Fenger,² of Chicago, thinks no attention should be paid to the appendix in case of abscess, except, of course, in early operations and in operations for acute suppurative peritonitis. Murphy³ believes it advisable to open and drain and make no effort to remove the appendix. Deaver,⁴ on the other hand, considers it incomplete surgery to leave the appendix behind, and believes it possible and always advisable to remove it, as in no other way will recovery be assured. So does Morton.⁵ While the majority of American surgeons are conservative on this point, we find the opposite view expressed by several distinguished surgeons abroad.

Lennander⁶ considers it dangerous to leave the appendix, even if we run the risk of opening the peritoneal cavity by searching for it. He had three cases of relapse where he did not remove it. Sonnenburg⁷ considers it his duty to remove it in every case possible, in order not to overlook coprolites and leave necrotic tissue behind, which will occasion relapse. It has been my custom in treating large abscesses after delayed operations simply to incise the abscess and leave the appendix alone. We may with the greatest ease, and in spite of all possible care, rupture the limiting adhesions and open the peritoneal cavity during such an attempt, and it is very difficult then to prevent pus from entering the abdominal cavity. I have seen death result from such an attempt in the practice of other surgeons, and I advise in these cases only to make

¹ Journal of the American Medical Association, March 9, 1896, p. 912.

² American Journal of Obstetrics, vol. xxviii., No. 2, 1893.

³ Medical News, January, 1895.

⁴ Loc. cit., p. 130.

⁵ Journal of the American Medical Association, 1888, p. 734.

⁶ Loc. cit., p. 33.

⁷ Loc. cit., p. 173.

incision and drain. Particularly is this the case if the appendix is found on the inner side of the cæcum or else extending inward, while we may safely remove it if we find it on the outer side of or below the cæcum. The danger of relapse and of fecal fistula when it is left behind is not great. Fowler¹ had recurrence twice in seventeen cases; Barton,² of Philadelphia, twice in twenty cases; Richardson,³ of Boston, twice in forty cases. I have had no recurrence in fourteen cases, but two suffered from fecal fistula, which, however, healed spontaneously in a few weeks. Wood⁴ states, after collective investigations, that recurrence occurs in these cases in less than five per cent. and then mostly within a few months. One point seems to be established: that first attacks terminate fatally more frequently and more quickly in children than in adults, and that, therefore, operative proceedings are still more necessary in childhood and should not be delayed.

In chronic recurring cases we hear less in America about the question, whether it is preferable to remove the appendix during the quiescent period, after the first attack, after the second attack, or during an attack, as it is here well recognized that there is no danger, or, at least, very little danger, connected with such an operation, and as the advantage to the patient of its removal would by far counterbalance the relapses with their possible dangers and the great waste of time. No American surgeon, at any rate, would delay operation on a patient who was suffering from an acute attack, in order to remove the appendix after he had recovered.

McBurney⁵ thinks that where a patient has had two attacks operation ought to be performed before a third

¹ Loc. cit.² *Annals of Surgery*, June, 1896, p. 755.³ Loc. cit.⁴ *Medical Record*, August 22, 1896, p. 257.⁵ Loc. cit.

attack occurs, the more so as many patients who have passed successfully through five or six comparatively mild seizures have on the next occasion become fatally ill, and because, as a rule, the more numerous the attacks the more difficult the operation on account of the dense and numerous adhesions.

Bull¹ says we need more carefully recorded cases, not only of patients who come to operation, but of those who have successive attacks relieved by medical measures. He operates when the attacks become frequent and severe. He found that the adhesions correspond to the severity of an attack. He reports statistics of four hundred and forty-two operations with eight deaths,—*i.e.*, one and four-fifths per cent. mortality. Fitz² believes recurrent attacks should be treated as first attacks. Removal between attacks should be advocated, if recurrence is so frequent as to debar the patient from enjoyment of life.

Deaver³ has no doubt that, without exception, every appendix that has been the seat of an inflammatory process is a source of danger to the life of the patient and should, therefore, be removed. White⁴ states that the interval in chronic relapsing cases is not one of perfect health: we find digestive disorders with pain, aggravated by exercise, and anæmia. Operation gives a very small mortality, if any. Perhaps the immunity of the peritoneum acquired after repeated attacks may, as Treves states, have something to do with the low mortality.

MEDICAL TREATMENT.

Under the antiphlogistic treatment prevailing more or less up to the present time, and within a few years preva-

¹ Medical Record, 1894.

² Boston Medical and Surgical Journal, June 19, 1890.

³ Loc. cit., p. 125.

⁴ Loc. cit.

lent in France, the mortality was simply enormous. The introduction of the opium treatment by Voltz,¹ later emphasized by Bamberger,² Leudet,³ With,⁴ and others, has without doubt reduced the mortality in the less serious cases and probably done much to prevent dangerous complications. Whether it has any effect in the serious cases is, however, questionable.

It is, of course, evident that the large majority of cases will be seen first by the family physicians, and that they will prescribe rest in bed, fluid diet, and local treatment, such as poultices or ice, leeches, etc.

We meet the most contradictory opinions when the question is about the use of opium or cathartics. *Opium* has, of course, no influence upon the disease itself and its cause, the microbes, but only upon one single symptom, the pain, and upon the peristaltic motions. The microbes will grow and develop, whether we give opium or not, and we gain principally a certain amount of comfort for the patients, which, however, may completely mask the symptoms and lead us to defer the operation. We would scarcely, with our present knowledge in pathology, call opium an antiphlogistic remedy. I acknowledge that it may be of great importance to prevent or perfectly suppress the peristaltic motions, particularly in threatening gangrene and perforation. We thereby give the peritoneum a chance to take measures and entrench itself against the threatening attack by fibrinous adhesions in the neighborhood. The adhesions are, however, often so weak and imperfect that they do not at all prevent per-

¹ Archiv für die gesammte Medicin, 1843, Band iv. p. 305.

² Ueber die Perforation des wurmförmigen Anhangs, Verhandlungen des physikalisch Med. Gesellschaft in Würzburg, 1859, Band ix. p. 123.

³ Archives générales de Médecine, 1859, vol. ii. p. 315.

⁴ Loc. cit.

foration into the peritoneal cavity. We are lulled asleep trusting in the action of opium, and awake first when the fortress is taken. Meteorism, which occurs during the use of opium, even if not severe, is partly injurious. Meteorism will occur in every serious case, however, and the use of opium may increase it. Physicians of great prominence and experience, however, and whose opinions are entitled to respectful attention, are in favor of the use of opium.

Pepper¹ considers opium in full doses the great standby, and condemns purgatives, except in typhlitis stercoralis and general peritonitis. He believes the mortality has been greatly lessened by its use. Osler² advises rest and opium, and warns against the indiscriminate use of salines, which mean more or less disturbance of the local conditions and a definite increase in the risk of general peritonitis. He believes, with Tait and Pepper, that salines sometimes do good in general peritonitis. In no country has the use of opium in our days been carried to such extremes as in Denmark, and nowhere can we better study the result, as we find it in universal use in the large hospitals. Prof. With³ noticed the unfavorable influence of cathartics on peritonitis after perforation, particularly that pain, vomiting, tenderness, and meteorism increase after defecation, and he uses them first when the local symptoms have completely disappeared. He tries to prevent even the spontaneous evacuation of the bowels by increased use of opium, as he in some cases has observed light relapses after its occurrence, and he keeps the patients constipated for twenty-four days, if

¹ American Text-book of Principles and Practice of Medicine, Philadelphia, 1894, vol. ii. p. 823.

² Practice of Medicine, 1894, p. 412.

³ Loc. cit., pp. 80 and 81.

necessary. The amount of opium used in localized and less severe forms is five or eight drops tincture of opium three times a day; in more severe forms ten drops three times a day, and an evening dose of fifteen drops, or a morphine injection of one-sixth of a grain. In diffuse peritonitis ten or twenty drops are used every half-hour or every hour, and repeated injections of morphine. The opium treatment is used in the lightest cases for ten days, in the more severe cases fourteen days or longer, up to twenty-four days; the amount has been increased to ten or fifteen drops in the lightest cases, fifteen or twenty drops, or a half-grain of morphine subcutaneously, several times a day in cases of localized abscesses, and twenty or thirty drops, with injections of one-half or three-fourths of a grain of morphine three times a day in diffuse forms. Spontaneous movements of the bowels occur usually when we cease its use, or after a clyster. The result of this treatment is a mortality of sixteen per cent. in all cases, but of fourteen cases with diffuse peritonitis twelve died, and of six cases with localized abscesses two died; of the serious cases, therefore, the mortality was seventy per cent.

In Dr. Floystrup's¹ statistics of one hundred and fifty-six cases there was a mortality of twenty-four,—*i.e.*, fifteen and four-tenths per cent.; but he reports only the history of the fatal cases, and there is absolutely no information about the recovered cases, except a report about how many in three groups—diffuse peritonitis, localized abscesses, and retrocæcal abscesses—had had physic before entering the hospital. If we consider the cases in these groups, thirty-four had diffuse peritonitis, of which thirteen died,—*i.e.*, forty per cent. ; of fifty-seven of the second

¹ Perityphlitis og dens Behandling, Kjöbenhavn, 1888.

group eight died,—*i.e.*, fourteen per cent.; while of the last group, sixty-five cases, three died,—*i.e.*, four per cent. It is not probable, however, that sixty-five of one hundred and fifty-six cases should have suffered from retro-cæcal abscesses, a comparatively rare form, and we must exclude this group as not giving clear and precise information. The two other groups would give a mortality of twenty-three per cent., but no information is furnished except about the fatal cases.¹ We may, however, conclude that under strict opium treatment in all cases the mortality will be about sixteen per cent. Compare this result with that of operative treatment in all cases, as mentioned on previous pages. Other physicians, and surgeons particularly, have quite different ideas about the use of opium in appendicitis. Hawkins² considers it best to err on the safe side of constipation. No purgatives should be given till the patient is well enough to leave his bed. Opium is essential in order to allay pain and prevent peristaltic motions, but he thinks it important to discontinue its use when these two objects have been gained, and it is seldom required beyond the first two or three days. He advises its use sparingly in all conditions where an operation may become necessary. A patient suffering from peritonitis and under the influence of opium is seen as through a glass, darkly. If he is thoroughly under its influence, the effect is so great that it may be difficult to take a serious view of the case, and surgical relief may be postponed in consequence until the final collapse has set in.”

Sahli³ believes that the treatment with large doses of opium has done much harm. He considers it more advantageous to the patients to use small doses, sufficient to

¹ Loc. cit., p. 29.

² Loc. cit., p. 118.

³ Loc. cit., p. 211.

control the colicky pains and make the patients comfortable.

Kelynack¹ considers opium useful when administered judiciously, but condemns strongly large dosing with opium, as it masks the symptoms. Deaver² considers its use dangerous, because it hides the symptoms and causes constipation, meteorism, and nausea. One of the most important symptoms is pain, which generally is in proportion to the degree of inflammation, and opium robs us of this valuable diagnostic aid. McBurney³ advises morphine after positive diagnosis has been made, but before that none, as it masks the symptoms. He also advises against cathartics in the beginning, as they increase vomiting and pain. Fowler⁴ says that, "above all things, the use of opium must be avoided as much as possible. Its use masks the progressive character of some of the most important symptoms."

Thornley Stokes⁵ thinks opium should be used most cautiously, and that pain is the only indication for its use. By concealing the pain "it may keep the surgeon in a fool's paradise." We find, on the other hand, just as strong adherents of the moderate use of cathartics.

Prof. J. W. White⁶ advises in all ordinary mild cases the use of salines until free purgation is assured, and then to continue the action more gently by divided doses of calomel. He uses opium only in cases of severe, spontaneous, colicky pains, and then combined with calomel. Thornley Stokes⁷ thinks purgatives are not to be dreaded

¹ Loc. cit., p. 156.

² Loc. cit., p. 119.

³ Dennis's System of Surgery, New York, 1896, vol. iv. p. 416.

⁴ Annals of Surgery, March, 1894, p. 334.

⁵ A Clinical Lecture on Inflammation of the Cæcum and its Appendix, British Medical Journal, June 1, 1895, p. 1192.

⁶ Therapeutic Gazette, June 15, 1894, p. 22.

⁷ Loc. cit.

except in cases of great acuteness and intensity. He gives two drachms of sodium sulphate every hour, till action of the bowels, but first tries an enema, which he considers the safest and best agent, as, in his opinion, the disease in the majority of cases depends upon an overloaded colon. Deaver¹ states that medical treatment consists mainly in the administration of laxatives, and that these should be used in the beginning of every attack of appendicitis.

Talamon² thinks there is a middle way between using cathartics systematically in all cases and discarding them altogether. It is, in his opinion, well not to use them in the onset, because the intestines, which are violently excited and under powerful contractions, might force the coprolite still farther in and effect its permanent lodgement. He believes, wrongly as Stokes, that these form in the cæcum. After depletion with leeches, he uses a purgative in order to empty the large intestines and produce peristalsis, which may force the coprolite into the cæcum again, from whence it came. Fowler³ states that, beyond the careful use of salines in the very commencement of the disease, and then only if the symptoms denote a mild type of the affection, the less medical treatment the better. McBurney⁴ (and most surgeons with him) avoids carefully cathartics and enemas, that all peristaltic action may be discouraged, as they increase vomiting and pain.

The main objection to opium seems, therefore, to be its power to mask the symptoms; the main objections to cathartics are the increased peristaltic motion, the pain, and vomiting. In my own practice I use opium in suf-

¹ Loc. cit., p. 116.

² Loc. cit., p. 185.

³ *Annals of Surgery*, March, 1894, p. 334.

⁴ *Ibid.*, April, 1891, p. 239.

ficient doses to make the patient comfortable and prevent peristaltic motions, as soon as the diagnosis is made and until the operation can be performed. I consider the use of cathartics in acute diseases decidedly dangerous. I have never seen them do good, and I have often seen them do distinct harm. I believe we ought to be careful in prescribing them, because we cannot in a given early case know with absolute surety the condition of the appendix. I believe cathartics would be harmless or even beneficial if we could know positively that there was no perforation present and that none would occur. Their use would probably more or less prevent limiting adhesions, but the derivation to the mucous membrane of the bowels and the absorption of exudates would counterbalance the injury which might result from that. It is quite another question whether we ought to use them after operation has been performed. I believe the earlier they are given after the operation, particularly if commencing diffuse peritonitis is present, the better for the patient, provided they are not vomited up again. We may often prevent this by irrigating the stomach first. I use them in cases of threatening peritonitis, or when peritonitis is present, as soon as the patient is able to swallow after the operation, and I prefer to give one-half grain or one grain of calomel with two and a half grains of soda every hour till ten grains or more have been used, and first then to give salts. The danger of entrance of the contents of the bowels has passed and the derivation to the mucous membrane of the bowels may probably prevent exudation, and therefore suppuration in the peritoneum, while increased peristalsis may probably prevent adhesions. I consider the patients convalescent if I succeed in producing four or five large fluid stools. In cases of chronic appendicitis, again, I consider it proper to use mild laxatives, such as one-tenth

grain of podophyllin two or three times a day, the more so as the patients almost always complain of constipation and other gastro-intestinal symptoms. Treves recommended salol in ten-grain doses two or three times a day. The only radical treatment is, however, extirpation of the appendix. In regard to local applications, I consider ice more useful in acute cases than poultices. Vomiting may often be prevented by sipping very hot water and by ceasing giving food by the stomach. The main point is to make an early diagnosis and to keep the patient absolutely at rest until operation can be performed. I believe, with McBurney, that "no purely medical treatment of actual value in preventing or controlling the disease has yet been presented to the profession."

SURGICAL TREATMENT.

It will easily be seen from the preceding pages that I consider appendicitis an exclusively surgical disease, dependent upon bacterial infection, and in the majority of cases independent of the cæcum. The surgical treatment is as great an improvement upon the opium treatment as this was upon the antiphlogistic treatment, but it must be used early. It is often a matter of a few hours, not of a few days. I have never yet regretted having operated too early, and I have operated on every case as soon as the diagnosis was clear; but I have often deplored being called in too late, when the patient already had diffuse peritonitis. I have so far not lost a patient from peritonitis on whom I operated because of chronic appendicitis or acute appendicitis with perforation and local abscess, or even for appendicitis with total gangrene but yet without perforation; but I have saved very few in whom I found gangrene with perforation and diffuse peritonitis at the time of operation. I consider every acute case with the

cardinal symptoms, severe pain, vomiting, rigidity, and rising temperature and pulse, particularly if it shows no inclination to recede in twenty-four hours, as ripe for operation. If the pulse continues to increase in frequency and reaches one hundred and fifteen or one hundred and twenty, and stays there, or gets higher, I believe the operation should be done at once. We gain nothing by waiting, we are unable to prophesy the result, and the operation grows more difficult and dangerous with each day of delay, while if done early it has a very small mortality. If, however, the symptoms commence to abate after twenty-four hours, I consider it proper to defer the operation to the quiescent period, after the first attack if the symptoms were severe, after the second attack if light and if a local tenderness and swelling of the appendix be felt on palpation of the appendix by Edebohls's method. I do not consider operation indicated unless we can by palpation satisfy ourselves that the appendix is in a pathological condition. As contra-indications I recognize very few, particularly unfavorable surroundings when the patient absolutely refuses to go to the hospital. The operation can safely be done in every clean and well-lighted room when we have proper assistance, reliable nursing, and plenty of boiled water; but a well-regulated aseptic operating room in a hospital is the proper place, and, where home surroundings are unfavorable, the condition *sine qua non*. As much depends upon the after-treatment as upon the operation itself. The common precautions of a laparotomy must be observed in every case.

1. Operation in Perforative Cases with Local Abscess.
—The method of operation in appendicitis with perforation and local abscess depends upon how early we get the case under treatment; in other words, whether we have a large local abscess after a disease of five or six

days' up to several weeks' duration, or only a fresh, small, intraperitoneal, limited abscess in the neighborhood of the appendix, with urgent symptoms, or when gangrene is suspected, or else the symptoms of diffuse pain and tenderness, rapid weak pulse, and prostration, indicate sepsis. In the first place, *large abscess*, it is advisable, I believe, simply to incise the abscess and drain it and leave the appendix alone, unless it is readily found and its removal can be accomplished without the risk of infecting the abdominal cavity. We will almost always find a large swelling when the disease has lasted one or two weeks, often clear on percussion from the development of gas in the abscess, and extending down to Poupart's ligament, where it terminates with a rounded margin. In such cases, which are usually dependent upon perforation of an appendix lying on the outside of the cæcum or below the cæcum, or else are primarily retrocæcal, the pus will be found either in the retroperitoneal tissue in front of the iliac fascia and behind the transverse fascia, or, if still intraperitoneal, it will have approached the anterior abdominal wall by crowding away the intestines from the lateral region, and the abscess will be walled in by adhesions. It was these forms which gave occasion to the first operations by extraperitoneal incision as advocated by W. Parker,¹ Gauley,² and Gurdon Buck.³

The incision is best made just above the outer half of Poupart's ligament, three or four inches long. It passes through the skin, the subcutaneous tissue, the fascia of

¹ An Operation for Abscess of the Appendix Vermiformis Cæci, Medical Record, 1867, vol. ii. p. 25.

² Transactions of the Medical Society of the State of New York, 1875, p. 345.

³ On Abscesses in the Lower Abdominal Cavity and its Parietes, New York, 1876.

the external oblique muscle, the internal and transverse muscles, and the transverse fascia. Edema of the deeper tissues is a sure proof of the presence of pus. Having passed through the transverse fascia, we lift up the peritoneum with a finger, if we do not already find pus, and we shall, as a rule, discover the abscess behind the peritoneum in the loose connective tissue. Otherwise we are often able to feel the swelling and fluctuation with the finger in front of the peritoneum, as the abscess is then still intraperitoneal, and to open it from behind with a curved trocar or a blunt director. There is no danger of opening the peritoneal cavity, as the abscess, even if intraperitoneal, lies between the finger and the peritoneal cavity proper. A slight pressure with the finger alone is often sufficient to rupture the posterior wall of the abscess and make it retroperitoneal. As soon as pus appears an artery forceps is introduced and opened widely; the cavity is carefully explored with the finger for coprolities, lightly irrigated, and two thick drains are introduced. The wound is not sutured, and is dressed in three or four days.

In cases in which the appendix extends inward we may find the tumor nearer the median line, forming a large prominence and not approaching Poupart's ligament. In these cases the incision must be made carefully over the most prominent spot of the tumor through the abdominal wall. The condition of the deeper tissues will show the presence of pus; there are strong adhesions all around, and with blunt instruments we will generally be able to open the abscess without invading the peritoneal cavity; should we, however, happen to invade the healthy peritoneal cavity before opening the abscess, it is advisable to introduce a finger and carefully examine the adhesions in order to find a place where the tumor is broadly adherent to the anterior abdominal wall. We then close

the peritoneal wound by sutures and incise in the other place.

The incision is made higher up if we get the case earlier, say from the fourth to the seventh day, and find that the swelling does not reach down to Poupart's ligament, but that there is a space of one-half to one inch between the ligament and the lower margin of the tumor. We may then make a curved incision around the anterior superior spine of the ilium down to the retroperitoneal tissue, lift the peritoneum up and explore carefully with the finger upward and inward. It is, however, I believe, preferable in these cases to make *laparotomy* by oblique incision through the muscles, about one inch inside the anterior superior iliac spine, so that we approach the abscess from the lateral margin, where we frequently will meet with the strongest adhesions. There is probably not much pus present, and we are perfectly able, even if we find no adhesions and therefore primarily enter the abdominal cavity, to open the abscess without infecting the peritoneal cavity by carefully packing antiseptic gauze and sponges beneath the margins of the wound. The adhesions are thereafter loosened slightly with the finger-nail or a blunt instrument till pus commences to appear, when it is rapidly mopped up with sponges as fast as it appears in the little opening made. After all the pus is out the adhesions are loosened more extensively, the cavity is carefully explored for concretions, and the appendix is then removed, if it be found in a place where this can be done without incurring any additional risk to the patient, particularly if found on the outside of the cæcum; we run, however, too much risk of rupturing the wall of the abscess and of infecting the peritoneal cavity if we try to remove it when it extends inward. The cavity is thereafter carefully mopped clean with aseptic

sponges held in an artery-forceps, drained with a wick-drain, and the upper and lower ends of the wound are sutured with a couple of strands of silkworm-gut.

In *still earlier cases*, in which the operation is performed on the second or third day, or earlier, on account of serious symptoms of perforation, which do not recede or indicate gangrene or septic lymphangitis, we perform a strict laparotomy. The point here is to expose the appendix and remove it in order to prevent more serious complications. We shall usually, under anæsthesia, be able to feel a little hardness and form a pretty correct idea about the position of the appendix. If we expect to find pus, I believe it safer to make the incision over the cæcum in an oblique direction, four inches long and one and one-half to two inches to the inner side of the anterior superior spine of the ilium, half of the incision lying above and half below the line from the anterior superior iliac spine to the umbilicus. We cut through the fibres of the external oblique, the internal oblique, and the transverse muscles for about three inches, then the transverse fascia, and lastly the peritoneum. We evacuate first any sero-fibrinous or sero-purulent exudation which may be found in the peritoneal cavity, by carefully mopping it up with aseptic sponges, and thereafter protect the peritoneal cavity with sterilized gauze introduced under the margins of the wound and held in place by the fingers of the assistants, who with the gauze crowd the bowels away from the wound. I always introduce a large sponge in an artery forceps down towards the pelvis, in order to particularly protect this region. We are now generally able to see where we may expect to find the appendix by fresh adhesions and agglutinations, and we loosen these carefully, mop up the small amount of pus found, dilate the opening, and disinfect the cavity and its surroundings with

peroxide of hydrogen. The appendix is then isolated with the fingers and blunt instruments. As a rule, we find it with ease by following downward one of the longitudinal bands of the cæcum, which leads directly to the appendix. If the mesentery is retracted and swollen, it may be easiest to ligate the appendix doubly, sever with scissors, and then loosen the outer part with blunt instruments till we can ligate the mesentery and remove the appendix. It is, however, more advantageous to commence to loosen the tip of the appendix and bring it and the end of the cæcum out through the wound, ligate the mesentery in sections, and then sever the appendix. It is of importance to ligate in healthy tissue in order to prevent cæcal fistulas. It may now and then be necessary to resect part of the cæcum in order to get into healthy tissue, particularly when the appendix is gangrenous near its insertion into the cæcum.

Treatment of the Stump.—Dr. Robert Dawbarn,¹ of New York, has devised a method which I have tried in a large number of cases and which has unusual advantages in proper cases. The method is as follows: First, a circular, continuous Lembert's silk suture is introduced through the superficial layers of the cæcum a quarter of an inch from the insertion of the appendix, and tied loosely; second, the appendix is thereafter amputated half an inch or more from the insertion; third, the stump of the appendix is dilated by introducing through it a fine forceps into the cæcum and gradually opening the forceps, whereby we dilate possible strictures and make the following step easier to perform; fourth, the stump of the appendix is caught with a fine-toothed forceps and invaginated half an inch into the cæcum, while we press the cæcum against

¹ Medical Record, August 31, 1895.

the forceps with a couple of fingers of the other hand; fifth, the circular suture is tied firmly and the toothed forceps removed. The advantages are, of course, that the serous surfaces are in apposition on account of the invagination, instead of the infected mucous surfaces as when we simply apply a ligature around the stump. We cannot use the method if we find the appendix very stiff and thickened or gangrenous near its insertion, nor if the wall of the cæcum is inflamed. Dawbarn advises, in that eventuality, to apply another circular suture one-quarter of an inch farther away from the first. The method will prevent cæcal fistulas, and the longer the stump is and the more the serous surfaces, therefore, are in apposition, the surer the result. The method has its place particularly in chronic, recurring cases, but it is exceedingly useful in acute cases, too, if the inner half-inch of the appendix is normal. Otherwise we will have to be satisfied with ligating the appendix with silk, having first, if possible, stripped the serous membrane back, disinfected the stump by scraping away the mucous membrane, and cauterized it with nitric acid or carbolic acid. The silk ligature is then applied around the mucous membrane and cut short, the serous membrane pulled down and united over the stump with a couple of Lembert's sutures, and the stump, lastly, invaginated in the wall of the cæcum with a few sutures or covered by a piece of the omentum. If the inner end of the appendix, however, is more or less diseased, we may have to be satisfied with ligating it with silk and disinfecting the cavity, and then surrounding it with iodoform gauze led out through the wound. Fowler¹ does not favor Dawbarn's method, as in

¹ Typical Excision versus Inversion of the Vermiform Appendix, American Journal of the Medical Sciences, February, 1897.

one case, in which the patient died ten days later from pulmonary complications, he found the invagination to have taken place between the muscular and serous coats of the cæcum. In another case he met with repeated hemorrhages from the bowels, due presumably to an artery in the wall of the appendix. I have occasionally seen arterial bleeding from the stump of the appendix, but have always ligated the vessel before invaginating the stump.

The stump having been disposed of and parts of the omentum removed if gangrenous, the field is properly disinfected. I consider it of importance thereafter in all suspicious cases, particularly if perforation was present, to introduce a finger down into the pelvic cavity, unless closed by adhesions, to convince ourselves that there is no stagnant exudation there. The peritoneal cavity must be thoroughly washed out with sterilized salt solution if we find a sero-fibrinous or purulent exudation in the pelvis. A glass or aluminum drainage-tube, containing a strip of dry sterilized gauze for capillary drainage, is thereafter introduced down to the bottom of Douglas's fossa, the surroundings of the appendix are packed with iodoform gauze, and the wound is left open or partly sutured and covered with dry sterilized gauze, particularly around the end of the capillary drain, which is changed when soaked through. The drainage-tube is removed as soon as the capillary drain remains dry. In three or four days the iodoform-gauze packing is removed, the cavity disinfected, and a smaller packing applied until healthy granulations appear. The wound may then be closed with secondary sutures. I consider this treatment the proper one in all cases in which we find pus, gangrene, and beginning sepsis. Sonnenburg¹ operated formerly in two

¹ Volkmann's *Klinische Vorträge*, neue Folge, No. 13, 1891, p. 79.

steps, but uses this method now only in cases with considerable meteorism and but indistinct resistance, which is deep and inaccessible to palpation. He incises then down to the peritoneum, plugs with iodoform gauze, and tries some days later to find the increasing exudation by exploratory puncture, if necessary. I consider this plan lacking all advantages. It is just such cases, with severe meteorism and slight resistance, which, as a rule, are the most serious, and in which perforation has occurred and septic peritonitis is present. They demand prompt laparotomy, with extirpation of the appendix and washing out of the peritoneal cavity, and they demand it promptly, and not the day after to-morrow. We are perfectly able to protect the peritoneal cavity with sponges and aseptic gauze while we search for the pus and evacuate it, if it still should happen to be limited by adhesions, and we are perfectly able to clean the peritoneal cavity if during the operation some pus should enter an otherwise healthy peritoneal cavity. The patient will unquestionably die while we wait for increasing exudation, if perforation with commencing septic peritonitis is present, instead of a local abscess. He operates in most cases, however, in one step: opens the abscess as broadly as possible, searches out the appendix under all circumstances, and removes it in every case when possible. I have already stated as my opinion and that of many prominent surgeons that, however desirable, it is unnecessary and may be positively dangerous to remove the appendix in some circumstances. Sonnenburg's incision is also in my opinion objectionable. He incises from just above the anterior superior spine of the ilium down to the anterior inferior spine of the ilium and then in a slight curve down to the middle of Poupart's ligament. This incision probably gives less occasion to ventral hernia, but it is a great deal easier to

find one's bearings and meet difficulties when we use an oblique incision through the muscles one or two inches inside the anterior superior spine of the ilium. I use an incision similar to that of Sonnenburg in cases in which the abscess has extended down to Poupart's ligament and in which the operation is only a simple oncotomy, but I would never advise its use when the intention is to find and remove the appendix itself.

2. In chronic recurring cases or in early acute cases in which we do not expect to find pus, the incision, in my experience, is best made through the sheath of the rectus muscle one-quarter of an inch inside the margin of the muscle. McBurney¹ advises against opening the sheath of the rectus, as there is bleeding from twigs of the deep epigastric artery and as it interferes with the subsequent neat apposition of the edges of the wound. It is, therefore, he says, better to place the incision just external to the commencement of the tendinous fibres, beginning the incision about one inch above a line from the anterior superior iliac spine to the umbilicus and corresponding to a line parallel to and half an inch to the right of the edge of the rectus muscle. The aponeurosis of the external oblique is separated without cutting its fibres transversely, the tendinous parts of the internal oblique and of the transverse muscles are divided for two inches, and the transverse fascia, the retroperitoneal fatty tissue, and the peritoneum are cut through for the same distance. I prefer, however, to open the sheath of the rectus muscle and pull the muscle inward. The branches of the deep epigastric artery are plainly seen and are ligated before being cut; behind the muscle we find first the fascia transversalis and then the peritoneum. The structures, after

¹ Dennis's System of Surgery, 1896, vol. iv. p. 418.

the operation is finished, are easily brought into apposition and sutured with rows of sutures, first the peritoneum and then the fascia transversalis. The rectus muscle is then replaced, the sheath neatly sutured, thereafter the aponeurosis of the external oblique, and lastly the skin. I use no drainage, and the wound has in every case healed by first intention. The rectus muscle lying in front of the deeper part of the wound prevents all inclination to hernia, which, in spite of the neat apposition and suture, may occur in McBurney's incision along the outer margin of the rectus, where all the structures severed are tendinous. The peritoneal cavity having been opened, the appendix is loosened, brought out through the wound with the lower end of the cæcum, amputated, and invaginated, and the wound closed as described, without drainage.

Morris¹ advises in these cases an incision one and one-half inches long in the right semilunar line, and allows his patients to get up in a week and a half. The short incision absolutely prevents ventral hernia and even the scar disappears by careful suturing. While it is possible in uncomplicated cases without adhesions to extirpate the appendix through this short incision, it has, in my opinion, no advantage over other methods, and makes the operation more difficult. Trendelenburg's position is often of advantage where no pus is present.

McBurney,² in order to avoid the damage to the abdominal wall by cutting transversely through the fibres of the muscles and to allow of more perfect replacement of the parts disturbed, has devised the following operation, to be used where complete closing of the wound is permissible. Skin incision about three inches long, be-

¹ Loc. cit.

² Dennis's System of Surgery, 1896, vol. iv. p. 421.

ginning one inch above the line from the anterior superior iliac spine to the umbilicus and crossing this line in a right angle one and one-half inches internal to the anterior superior iliac spine. The fibres of the external oblique muscle are separated bluntly and retracted with two lateral wound-retractors. We meet then the internal oblique and transverse muscles, whose fibres cross those of the external oblique, and these muscles are also separated bluntly and retracted with wound-retractors upward and downward. The wound which originally was vertical is now transverse, and the peritoneum is opened in a transverse direction, and the appendix found and removed. The peritoneum and the transverse fascia are then sewed together with a continuous catgut suture, the different muscles smoothed out in the different planes with the fingers, four or five approximation sutures applied to the separated internal oblique and transversalis muscles, and lastly the skin incision is sutured. The muscles quickly regain their tone, and ventral hernia is impossible. I have tried this method several times in uncomplicated cases successfully. It is, however, more difficult than the incision through the rectus, gives very little space, and is out of place if we should meet pus. In a personal letter of December 27, 1896, Dr. McBurney says: "I have done this operation at least a hundred times, and not in one case has there been the slightest weakening at the point of entrance. The time spent in bed is two weeks. Richardson, Stimson, and operators in Chicago and Philadelphia tell me that they now never do any other operation in the interval, where no pus is present. The opening made is usually small because a large opening is not usually needed. But the opening can be made really large, if necessary, without altering the method or losing its advantages. One has only to continue the separation

of the internal, oblique, and transversalis from the rectus muscle to the crest of the ilium. Through this opening one can do almost anything."

3. **Retrocæcal Abscesses.**—The swelling is much deeper and indistinct at the commencement in cases in which an appendix is attacked which lies behind the cæcum and in reality is retroperitoneal. We find the most severe pain in these cases by deep pressure in the lumbar region, just as we after some time may meet a protrusion here. The incision ought in these cases to be made from behind or in the lateral region, and we may without danger explore with a hypodermic needle in different directions in order to find pus. It is just in these cases that the abscess may develop to an enormous degree and extend upward behind the kidney,—even up to the liver. Should it happen in such a case that we misjudge the position of the abscess and make laparotomy, we ought, of course, to close the laparotomy wound and incise from behind as soon as we find out our mistake. These cases, however, will rarely be submitted to early operation: there are no urgent indications and we have time to wait without endangering the life of the patient.

4. **Operation in Diffuse Peritonitis.**—The prognosis depends in diffuse cases absolutely upon the time of operation. Richardson¹ is convinced that in all serious cases there is perforation present from the very beginning, and that the first symptoms depend upon perforation and not upon catarrhal and ulcerative processes in the mucous membrane. This view is, however, not correct. I have in a number of cases met a gangrenous, but still not perforated, appendix at early operations, and the prognosis is quite favorable in these cases, at least I have not lost

¹ Loc. cit.

any of these patients. The prognosis is still moderately favorable by early operation, if perforation occurs without limiting exudations, but with a small opening, and there is stricture of the appendix present, which prevents the contents of the bowels from flowing out; but it depends often upon a few hours whether we are able to save the patients or not. The case is about hopeless if we find a large perforation with direct communication with the cæcum, through which the contents of the bowels flow out in a steady stream. We may in these cases, by early operation, find a sero-fecal, badly-smelling exudation in the peritoneal cavity, but still without exudations of lymph, and we hope for the best. We find, nevertheless, as a rule, that the peritonitis progresses in spite of laparotomy. These cases are probably fatal from the time of perforation, on account of the violent infection. Richardson compares them, and not without reason, to gunshot wounds of the bowels. Our only reliable resource is to forestall perforation or else to operate as early as possible.

McBurney¹ advises an incision four or five inches long, as near the anterior superior spine of the ilium and the outer part of Poupart's ligament as possible. All fluid possible is removed from the peritoneal cavity with sponges, and the appendix thereafter extirpated. All purulent or sero-purulent products are then sponged away as thoroughly as possible from the pelvis, between the coils, up towards the liver, etc., and the abdominal cavity is thereafter irrigated with sterilized salt solution of the usual strength,—*i.e.*, six-tenths per cent.,—the solution being as hot as can comfortably be borne by the operator's hand, and the irrigation being continued in dif-

¹ Medical Record, March 30, 1895.

ferent directions until the fluid returns perfectly clear. The pelvis is thereafter sponged as dry as possible, and a long glass drainage-tube, containing a strip of dry sterilized gauze for capillary drainage, passed to the bottom of the pelvis. Meshes of iodoform gauze are passed up in different directions according to where pus was found, the wound is plugged down to the stump with iodoform gauze, without being sutured, and dressed with sterilized gauze, which is changed when soaked through. I prefer, however, drains of dry sterilized gauze, surrounded in the middle by rubber tissue-paper, to the iodoform gauze, which becomes strongly adherent by granulations growing into its meshes. Severe bleeding is caused by its removal, and the fresh adhesions are torn in the surroundings. The glass tube in the pelvis is cleaned every few hours and removed in twenty-four or thirty-six hours, the deep packing in from three to five days. The patient is fed by nutritive enemata, the flatulence treated by a large soap-and-water enema after twenty-four hours, and laxatives are used only when the enema is ineffectual. This is essentially the treatment I have been in the habit of using, except that I use laxatives earlier after the operation.

McBurney had in twenty-four cases fourteen recoveries,—*i.e.*, a mortality of forty per cent.; Richardson,¹ nine recoveries in thirty-two cases,—*i.e.*, seventy-five per cent. mortality; Fenger had ten deaths in eleven cases; Mikulicz, nine deaths in thirteen cases; Willy Meyer² saved three out of four, when operated on inside of twelve hours after perforation, while all died who were operated on later. I have had twenty cases with five recoveries,—*i.e.*, seventy-five per cent. mortality.

¹ American Journal of the Medical Sciences, January, 1894.

² Medical Record, February 29, 1896.

Dawbarn¹ found in a case after laparotomy fluid fæces and stinking pus everywhere between the bowels and down in the pelvis, and the bowels were exceedingly congested and inflamed. The appendix was gangrenous, except the inner quarter, and perforated at several points, through which fluid fæces streamed out. He amputated the appendix and then enlarged the wound to a length of seven inches, and eviscerated the patient as perfectly as possible, so that almost all the bowels were outside the abdominal cavity. He cleansed them perfectly with warm salt solution, irrigated the empty peritoneal cavity everywhere, then replaced the bowels and sutured the wound partly, leaving open the middle part, through which numerous sterilized gauze tampons were introduced in different directions. The patient recovered. This case shows that we cannot be too thorough in desperate cases with large perforations and entrance of fæces into the abdominal cavity. They are absolutely fatal without operation, and this gives them their only chance, even though a poor one.

The successful cases of Morris² depended, without doubt, upon the thoroughness with which he disinfected the bowels and upon his extensive use of drains. He advises, when the peritoneal cavity is filled with pus and exudations of lymph, to irrigate first with five hundred or one thousand grammes of hydrogen peroxide in different directions, and two or three minutes later to wash out with a few gallons of warm salt solution. In cases of extensive adhesions of the bowels by fresh exudations of lymph and multiple small collections of lymph between the adherent bowels, he introduces the whole hand and loosens thoroughly all adhesions before injecting the per-

¹ Medical Record, August 31, 1895.

² Loc. cit.

oxide of hydrogen. He saved a moribund patient by this proceeding.

It may, lastly, have its advantages to open the abscess from the rectum or vagina when in late cases we find the abscess prominent there. It is one of the methods which nature brings into use in neglected cases. I would, however, hesitate to open an abscess from appendicitis through the rectum.

My conclusions in regard to the methods of operation are, therefore, that we do not possess any method which gives satisfaction in all cases; but that, on the contrary, every case must be studied by itself, and the method chosen which, with least danger to the patient, makes us able to evacuate the pus, remove the appendix where this is indicated, and thoroughly disinfect the bowels and the peritoneal cavity where we find peritonitis present.

As *general conclusions*, I state as my opinion, based upon a large experience and careful perusal of the surgical literature, that there is a point of time in every case of appendicitis at which recovery is possible by operation. The prognosis depends solely upon this point of time. We will save our patients if we operate before perforation with resulting diffuse peritonitis has occurred. They will, as a rule, die in spite of the operation if we wait till diffuse peritonitis is present. It is often a question of a few hours, rarely of a few days. We ought immediately to operate in every case which commences with acute severe pain, vomiting, rigidity, fever, and does not recede inside of twenty-four hours, as we cannot know positively the condition of the appendix, or whether there is commencing gangrene or even perforation present. We cannot operate too early; we are often too late. Medical treatment is unable to prevent gangrene or perforation, or to save the patient after peritonitis has occurred; the only

reliable help to be found is in surgical treatment. The earlier the operation is performed the better is the prognosis and the surer the recovery, and that, too, a recovery which is radical.

STATISTICS.

I add statistics of seventy-five personally operated cases, the great majority of which were operated on in the Sisters of Charity Hospital in Buffalo. The earlier histories are, perhaps, somewhat meagre, being written by the hospital internes. These seventy-five cases do not, by any means, represent all the cases I have operated on, but only those cases of which I have, with a few exceptions, conducted the after-treatment myself. I have, besides, operated on many patients in the country and surrounding towns, but I only saw them during the operation and have no histories of these cases. I will also call attention to the fact that all the laparotomies, sixty-nine in number, were performed since 1893. Before that time I saw only cases with perforation and large local abscesses, which all recovered by extraperitoneal operation. Cases of gangrene, perforation, and diffuse peritonitis did not then come under my notice, as they died at their homes under medical treatment. I have seen very few cases with large local abscesses during the last three or four years. Cases are diagnosed earlier and treated by laparotomy while the abscess is still small.

The first group, appendicitis with localized abscess, is represented by seventeen cases, Nos. 1 to 17 inclusive. Six of these, Nos. 1 to 6 inclusive, were operated upon by the extraperitoneal method, of which five recovered and one died. The operation was performed on the sixth day in one case, on the seventh day in one case, during the second week in three cases, and after the

fourth week in one case, this patient dying of septicæmia shortly after the opening of an enormous retrocæcal abscess, which had been overlooked by the attending physician. Laparotomy was performed in eleven cases, of which nine recovered and two died, one from embolus of the iliac vein and one from peritonitis from perforation of the local abscess before operation. Two cases were operated on the fourth day, three on the fifth day, one on the sixth day, one on the seventh day, and four in the second week.

The second group, cases Nos. 18 to 30 inclusive, is represented by thirteen cases, all of which had more or less total gangrene, but yet without perforation. They all recovered by prompt laparotomy and extirpation of the gangrenous appendix. Two cases were operated on during the first twenty-four hours, five on the second day, two on the third day, three on the fourth day, and one on the seventh day. These cases are the most interesting, as giving conclusive evidence of the importance of operating before perforation has occurred. No one can doubt that perforation with profuse peritonitis would shortly have occurred, and that they all would have died under any other than surgical treatment.

The third group is represented by twenty cases, Nos. 31 to 50 inclusive, all of which had gangrene with perforation and beginning or diffuse peritonitis. Five of these recovered, while fifteen died, one of gangrene of the cæcum and one of pylephlebitis suppurativa after the peritonitis had disappeared, and thirteen of diffuse peritonitis. Two were operated on inside of twenty-four hours: three on the second day, three on the third day, five on the fourth day, two on the fifth day, four on the sixth day, and one on the seventh day. The five who recovered were operated on in two cases on the first day, in two

cases on the second day, and in one case on the third day. Of the fifteen patients who died, one was operated on during the second day, two on the third day, five on the fourth day, two on the fifth day, four on the sixth day, and one on the seventh day. Comments seem unnecessary. All died if operated on later than the third day.

The fourth group is represented by two cases, Nos. 51 and 52, who suffered probably from septic lymphangitis. One recovered by laparotomy inside of twenty-four hours; the other was operated on in extremis on the second day and died.

The fifth group is represented by twenty-three cases, Nos. 53 to 75 inclusive, all of which suffered from chronic recurring appendicitis. Twenty-one recovered and two died, one from meningitis independent of the operation, and one, operated on for ileus on account of adhesions from chronic appendicitis, of shock.

Of the seventy-five cases, forty-seven were males and twenty-eight were females,—*i.e.*, respectively sixty-three and thirty-seven per cent.

In regard to age, nine patients were between five and ten years of age; twenty-one were between ten and twenty years of age; twenty-four were between twenty and thirty years of age; fourteen were between thirty and forty years of age; five were between forty and fifty years of age; two were above fifty.

In regard to previous attacks, it is noted that twenty-nine had had no previous attack; eight had had one attack; six had had two attacks; nine had had three attacks; five had had four attacks; seven had had many attacks.

In regard to etiology, coprolites were found in twenty-six cases; foreign bodies were found in one case; cystic dilatation was found in fifteen cases; strictures were found

in twenty-two cases; acute bends were found in five cases; traumatism was found in four cases; constipation and over-eating, in seven cases.

Of complications were noted, meningitis in one case; fecal fistula in two cases, both healing spontaneously; apparent coxitis in one case; intestinal obstruction in two cases; floating kidney, phlebitis of femoral vein, gangrene of cæcum, pylephlebitis suppurativa, and hæmatosalpinx, each in one case.

The appendix was removed in sixty-one cases, and was not removed in fourteen cases. No relapse has followed in these fourteen cases. Laparotomy was performed in sixty-nine cases; extraperitoneal incision in six cases.

PART II.

CASE NO. 1.

Henry H., twenty-two years of age, clerk. Appendicitis with perforation and local abscess, extraperitoneal operation, recovered.

The patient, who formerly had been healthy, had been sick in bed for eight days, with the usual symptoms of appendicitis: fever, pain, vomiting, and infiltration in the right ileocæcal region. I was called in on the 11th of February, 1889, and found rigidity of the muscles over the right inguinal region, and a large swelling in the ileocæcal region which had extended downward to Poupart's ligament.

Same day: extraperitoneal incision just above the ligament.

A large abscess, which contained about ten ounces of stinking pus, was found behind the peritoneum. The cavity was drained, and healed in the course of three weeks. He has been well since.

CASE NO. 2.

August B., twenty-six years old, lawyer. Appendicitis with perforation and local abscess, extraperitoneal operation, recovered.

The patient had been sick seven days, with the usual symptoms of appendicitis. I saw him on the 22d of August, 1889, in consultation, and found a large swelling in the right ileocæcal region extending almost down to Poupart's ligament.

Same day: extraperitoneal operation.

The incision was made a little too high up. The peritoneal cavity was opened and the omentum prolapsed. The wound was therefore sutured and an incision made just above the ligament, the peritoneum lifted up, and a large, extraperitoneal abscess evacuated. He recovered in the course of three weeks, and has been well since.

CASE NO. 3.

Henry McD., twenty-seven years old, laborer. Appendicitis with perforation and retroperitoneal abscess, septicæmia, death.

The patient was taken sick on the 25th day of March, 1890, with the usual symptoms of appendicitis. A physician was called in on the 27th of March, and found the patient with high fever, temperature 103° F., pain in the ileocæcal region, beginning meteorism, and a pulse of 96. I was called in consultation, and advised an operation after some days, when the local abscess, which could not yet be felt, had developed and extended down towards Poupart's ligament. I first saw the patient again on the 23d of April. The condition had during these four weeks grown worse. He had had continual fever, with frequent chills, was excessively emaciated, had a small, quick pulse, and a profuse, cold perspiration, dry tongue, and was evidently in extremis. His physician questioned the diagnosis of appendicitis, as no swelling was seen in the ileocæcal region, and as he during the four weeks' disease had been unable to feel any swelling there. I discovered an enormous, fluctuating swelling in the lumbar region, ready to perforate the skin. I incised it without narcosis and evacuated several quarts of stinking pus, mixed with large masses of gangrenous tissue. A finger introduced explored an enormous cavity, which extended up behind

the kidney to the liver and had produced gangrene of all the retroperitoneal tissue. The patient died the same day.

CASE NO. 4.

Willie P., eleven years old, school-boy. Appendicitis with perforation and local abscess, extraperitoneal operation, recovered.

The patient eight weeks previously had had a similar attack, but recovered by rest, diet, and mild cathartics, although some local tenderness continued in the right ileocæcal region. On the 2d of July, 1890, he suffered a slight contusion of the abdomen by a fall. Severe pain occurred thereafter in the right ileocæcal region, extending upward towards the navel. He suffered from high fever, temperature 103° F., and lost his appetite. The condition had since been unchanged. He had continued to have fever (101° – 103° F.) and the pains continued in the ileocæcal region, with increasing meteorism. I saw him in consultation on the 8th of July, 1890. A hard swelling was found in the right ileocæcal region, which extended down to Poupart's ligament, where it terminated with a free, rounded margin. Considerable pain on the slightest palpation. The left side of the abdomen was soft and without pain. The bowels had moved the day before, after castor oil.

Extraperitoneal operation, parallel with and just above Poupart's ligament.

The peritoneum was lifted up from the iliac fascia and the abscess found behind the peritoneum; it contained six ounces of stinking pus. Drain-tubes were introduced, the cavity was disinfected, and antiseptic dressing applied. No concrement was found in the abscess cavity, and the appendix could not be felt.

July 21.—Drainage-tube removed, as the wound was superficially granulating.

July 28.—Patient discharged, recovered.

August, 1895.—Patient has since been perfectly well.

CASE NO. 5.

Clement D., twenty-four years old, hotel porter. Appendicitis with perforation and local abscess, extraperitoneal operation, recovered.

The patient had for nine days been sick, with pain in the ileocæcal region, vomiting, continual high fever, and a moderate pulse. I saw him in consultation the 13th of September, 1892. He had then a very large swelling in the ileocæcal region, which extended downward to Poupart's ligament, covered by rigid muscles.

Same day: extraperitoneal operation, by which about one pint of stinking pus without concretions was evacuated. The cavity was drained, and the patient recovered in the course of four weeks. He has since been well and had no relapse.

CASE NO. 6.

Mr. W. P. N., fifty years of age, publisher. Appendicitis with perforation and local abscess, extraperitoneal operation, recovered.

The patient, who formerly had complained of slight gastro-intestinal symptoms, suffered during a visit in New York with severe pains in the right ileocæcal region. He returned after a few days, on the 9th of June, 1893, to Buffalo, as the pain had increased, in spite of local treatment. His physician found then considerable tenderness over McBurney's point, and twenty-four hours later a well-marked swelling in the right ileocæcal region. He was treated with light physic and poultices. I was called in consultation the 18th day of June, 1893. The patient

was then quite exhausted; had a continual fever, with severe pain in the ileocaecal region. A large, hard swelling was felt there, which extended down to Poupart's ligament, where it terminated with a rounded margin and inward to the margin of the right rectus muscle.

Same day: extraperitoneal operation, with an incision parallel with and just above Poupart's ligament.

The peritoneum was lifted up from the iliac fascia and the abscess was found, which contained about eight ounces of stinking pus. The abscess was hour-glass formed, showing that it had originally been intraperitoneal. The appendix could not be felt in the inner cavity. The cavity was disinfected, drain introduced, and an antiseptic bandage applied. The convalescence was somewhat slow, but he has since been perfectly well.

CASE NO. 7.

Miss Clara B., sixteen years of age. Appendicitis with perforation and local abscess, laparotomy, recovered.

The patient had been sick ten days with pain in the abdomen, slight fever, and general malaise. She continued, nevertheless, to attend school until the 19th of November, 1893, when she felt so sick that a physician was called in. He diagnosed typhoid fever, and treated the symptoms with anti-febrile remedies and laxatives, after the use of which the patient grew worse. I was called in consultation the 22d of November, 1893. The temperature at the examination was 103° F., pulse 120. A considerable swelling, with infiltration and tenderness, was felt in the right ileocaecal region, with rigidity of the muscles, while the left side did not seem to be involved. I had her removed to the Sisters of Charity Hospital, and operated on her arrival.

Extraperitoneal operation was tried first, as she seemed to have a localized abscess.

A curved incision was made around the anterior superior spine of the ilium. The peritoneum was lifted up from the iliac fascia and fossa iliaca explored with the finger and a fine trocar. The different tissues were found very œdematous, but no abscess could be reached. A drainage-tube was therefore introduced, and the wound sutured, after which I performed laparotomy, with the usual oblique incision through the muscles over the cæcum. Numerous adhesions between the overlying intestines and the cæcum were seen after the peritoneum was opened. The field was therefore protected with sterilized gauze compresses, by aid of which the intestines were kept back, and the adhesions were loosened. The abscess was found at the outer side of the cæcum and downward, and contained about ten ounces of stinking pus, which was wiped up slowly with sponges. I did not try to remove the appendix, as I could not feel it, and as it would be difficult to prevent infection of the peritoneum while manipulating the large pus cavity. The abscess cavity was therefore thoroughly disinfected, a thick rubber drain surrounded by iodoform gauze introduced, while the peritoneal cavity was protected by a large piece of rubber tissue paper, which was introduced from the median side of the incision to the inner wall of the abscess. The cavity was loosely plugged with iodoform gauze and the upper end of the wound sutured. R Calomel, five grains, two doses, with one hour interval, and two hours later sulphate of magnesia one-half ounce.

The patient was somewhat exhausted after the operation, and was stimulated with hypodermic injections of strychnine and whiskey.

November 23. — Copious movements of the bowels

towards morning. Temperature 100° – 103° F., pulse 140–150. Continued hypodermic injection.

November 24.—Temperature 101° F., pulse 130. Outer dressing changed.

November 25.—Temperature 99° F., pulse 108. The patient was much improved. No meteorism. The abdomen soft and painless.

November 26.—The rubber tissue, iodoform, and drain removed, the cavity irrigated, and a smaller drain introduced. Pulse and temperature normal. She now improved rapidly, and was discharged on the 13th day of December with the wound almost healed. It healed during the following week, and she has since been in perfect health.

CASE NO. 8.

Eugene S., nine years of age. Appendicitis with gangrene, perforation, and local abscess; secondary perforation into the peritoneum, laparotomy, death.

The patient was taken sick suddenly on the 11th of January, 1893, with colicky pains, vomiting, and light diarrhœa. These symptoms improved after a few hours, and the patient complained thereafter only of a pain in the left iliac region, which by and by became localized in the right ileocæcal region, with pronounced tenderness over McBurney's point. He lost his appetite, and obstinate constipation had been present since. He commenced at the same time to get feverish, and the pulse became quick. I was called in consultation on the 16th of January, during the evening, and found the patient then with a temperature of $102\frac{1}{2}^{\circ}$ F., pulse 110, respiration 34, partly abdominal, the tongue brown and dry. There was pronounced rigidity of the muscles over the right ileocæcal region, with severe pain over McBurney's point. A deep swelling was felt and the subcutaneous veins

were strongly dilated over the region. The left iliac region was not painful, and there was no muscular rigidity here. I advised immediate operation at the Sisters of Charity Hospital, but the patient was first sent in next day, during the clinical lectures. The condition was then unchanged, and the symptoms pointed to perforation, with formation of a local abscess, but yet without diffuse peritonitis. Operation was delayed for some hours, for unavoidable reasons. The patient grew suddenly worse six hours after his entrance, with a condition of collapse and shock, with pains over the whole abdomen and a pulse of 130.

Laparotomy was immediately performed, as it was evident that the abscess had perforated into the peritoneal cavity. Usual oblique incision through muscles. A large amount of stinking, sero-purulent fluid flowed out as soon as the peritoneum was opened, and it continued to come away from the whole peritoneal cavity. The omentum was thickened and adherent to the region, but the peritoneum itself was still not congested, nor were the bowels agglutinated. The appendix was found beneath the omentum and contained a large perforation, which was lying in an abscess which was limited by exudates and showed a secondary perforation into the abdominal cavity. Stinking feculent fluid flowed out through the perforation in the appendix, and a large concrement was found just inside the perforation. The appendix was amputated and the region disinfected. The pelvic cavity was found filled with sero-feculent fluid, containing a few fibrinous exudates. The abdominal cavity was therefore irrigated thoroughly, and a glass drain introduced down in Douglas's fossa and iodoform gauze down to the stump. The wound was not sutured.

January 18.—Symptoms of diffuse peritonitis had de-

veloped, with meteorism and costal respiration, vomiting, and great prostration. The patient died during the day.

CASE NO. 9.

Mrs. B., twenty-two years old, housewife. Appendicitis with perforation and local abscess, laparotomy, death.

The patient during the previous year had three attacks of pain in the right ileocæcal region, accompanied with vomiting and high fever. She had a relapse five days before I saw her, and this time much more serious, and the condition had since grown worse day by day. I was called in consultation on the 2d of December, 1893. I found the abdomen considerably enlarged, and a distinct swelling was felt in the ileocæcal region, with pronounced tenderness over McBurney's point. The temperature was $102\frac{1}{2}^{\circ}$ F.; respiration 28, costal; continuous vomitings. She was immediately transported to the Sisters of Charity Hospital, and laparotomy was performed, the stomach first having been irrigated. Usual oblique incision through the muscles. Considerable local peritonitis was found in the neighborhood of cæcum, with agglutinated bowels. The peritoneum and the intestines were protected with gauze compresses and the adhesions loosened with care. The field of operation was suddenly filled with an enormous amount of stinking pus, estimated at ten ounces. It was quickly wiped up with sponges. A large concretment came out with the pus. The abscess cavity was found on the inner side of the cæcum, and downward, the inner wall being formed by two coils of intestines, the posterior wall by mesocolon. The cavity was disinfected, but I did not try to find the appendix, as I still considered the peritoneal cavity intact, and as I feared to rupture the deep adhesions. A glass drain and iodoform gauze were introduced and the inner wall protected with a piece of

rubber tissue paper. The wound was partly sutured. R Calomel one grain, soda two and a half grains, every hour, till ten powders were used; thereafter sulphate of magnesia one-half ounce.

December 3.—The bowels had not moved. No vomiting, but some nausea, on account of which irrigation of the stomach was made. The condition otherwise good. She collapsed suddenly during the night, and died with symptoms of an embolus,—probably from the iliac vein. Post-mortem examination was not allowed.

CASE NO. 10.

Mrs. Louisa S., thirty-one years old, widow. Appendicitis with perforation and local abscess, laparotomy, recovered.

The patient stated that during the previous three years she now and then had suffered from pain in the abdomen, which, as a rule, had disappeared more or less quickly by the use of common house remedies. She was taken sick on the 7th of October, 1895, with severe pain around the navel. The pains were not alleviated this time by house remedies, but increased little by little, and became most pronounced in the ileocæcal region. She went to bed on the 9th of October and used hot applications, which alleviated the pain somewhat. The condition grew worse little by little, but her family physician was first called in on the 12th of October when she had a severe chill. She had had neither vomiting nor diarrhœa. He found considerable meteorism; the abdomen was tender everywhere, but particularly upon pressure over McBurney's point. The temperature was 102° F., pulse 100. He ordered sulphate of magnesia and enemata. I was called in on the 13th, as the condition continued to grow worse, although the meteorism had disappeared after copious

movements of the bowels. The temperature at examination was $102\frac{1}{2}^{\circ}$ F., pulse 120. Some rigidity over the ileocæcal region, where a hard, sausage-shaped swelling was felt, which extended down towards the middle part of Poupart's ligament. The left side of the abdomen was normal. She was conveyed to the Sisters of Charity Hospital, where laparotomy was performed with the usual oblique incision, four inches long, through the muscles. Some agglutinated coils of intestines were seen covering the cæcum after the peritoneum had been opened. The bowels and the peritoneum were, therefore, protected with sterile gauze compresses and the adhesions slowly loosened from the cæcum. A small abscess, which contained about half an ounce of pus without smell, was opened. The cavity was disinfected and the appendix searched out. It was found extending downward towards the pelvis, where it formed an acute angle, and the tip extended from there backward almost up to the cæcum. The tip was gangrenous, and a small perforation was found about one inch from the tip. The bowels were firmly agglutinated in the neighborhood and formed the anterior wall. The mesentery of the appendix was much thickened and retracted, and was ligated with some difficulty. The appendix was, therefore, amputated. The mucous membrane was found ulcerated and partly gangrenous; did not contain any concretions. The abdominal cavity was not attacked and was not irrigated. A wick drain surrounded by a protective was introduced down to the stump, the outer end of the wound sutured with three silkworm-gut sutures, and sterile dressings were applied.

October 14.—Temperature $98\frac{3}{4}^{\circ}$ F., pulse 84, respiration 22. Felt well.

Ordered sulphate of magnesia, two drachms, every second hour.

October 15.—Copious movements. Normal pulse and temperature. Still free discharge through the drain.

October 16.—The drain removed and a small iodoform gauze tampon substituted.

October 20.—Feels well. The sutures removed.

October 31.—Discharged recovered, with abdominal support.

CASE NO. 11.

Mrs. L., age thirty-three, housewife. Acute appendicitis with local abscess, laparotomy, recovery.

This patient had been subject to severe abdominal pains periodically for the past ten years, but, as they seemed to come and go with her menstrual periods, the cause was attributed to some uterine disorder. On the afternoon of November 21, 1895, she was taken with severe chills and slight vomiting. There was no cessation of chills for twenty-four hours. At this time she noticed a slight pain in epigastrium, which later presented itself in right iliac fossa. When first taken sick, patient went to bed, where she remained till brought to hospital. It might be noted that on the date of her present illness she began to menstruate. The pain in the right iliac fossa becoming more severe, a physician was called November 24. A diagnosis of inflammation of the bowels was made at that time, and the patient was treated for that ailment up to the time of her admission to the hospital, she going there upon the advice of her physician.

December 11, 1895.—Upon examination I found deep-seated swelling and rigidity of the abdominal muscles on the right side, and the slightest pressure in this region was so obviously painful that deep palpation was out of the question. There was also considerable pain on pressure in both inguinal regions, particularly the right. Patient's bowels had been moving about every third day.

She frequently had pain on vomiting, and very often urine was scanty and high-colored. Pulse 98, respiration 20, temperature $99\frac{1}{5}^{\circ}$ F.

December 13.—Laparotomy, under chloroform narcosis, the incision being made obliquely downward and inward, about one and a half inches to inner side of the anterior superior spine of ilium. Cæcum was found adherent on outer side, and while endeavoring to free it a pus cavity was opened, from which between two and three ounces of pus was taken. By introducing the finger it was found that the cavity extended downward and inward in the pelvis. The abscess was well circumscribed, and the appendix was not removed. Cavity was thoroughly irrigated with sterilized water, after which a wick drain was inserted; edges of wound were approached by silkworm-gut sutures. Dry sterilized compresses were put on and a binder was applied.

December 17.—Wick removed and rubber drainage-tube inserted in wound, and cavity washed out with sterilized water; irrigation repeated twice daily.

December 21.—Tube removed and iodoform gauze laid over wound.

January 20, 1896.—Patient discharged recovered.

CASE NO. 12.

Fred. A., sixteen years of age. Appendicitis with perforation and circumscribed abscess, laparotomy, recovery.

About the beginning of November, 1895, patient was taken with pains in right iliac region; fever, but no vomiting. These symptoms persisted a few days but passed away. On March 16, 1896, he was again taken with pains in the same region; vomiting, which persisted for three days, and fever. A physician was called, who prescribed cathartics. On aggravation of these symp-

toms, another physician was called in, who advised his removal to a hospital. Frequent motions after physic during first twenty-four hours after his admission to the Sisters of Charity Hospital, to which he was conveyed. On examination I found his tongue coated, abdominal respiration, moderately great distention of the abdomen, muscular rigidity, and a hard, infiltrated mass reaching from the outer margin of the rectus muscle (which felt like a coil of intestine) down to about one inch above Poupart's ligament and upward to McBurney's point. Pulse 66, temperature 101° F.

March 24, 1896.—Laparotomy, with a three-inch incision through muscles over most prominent part of swelling, two inches inside anterior superior iliac spine. It was difficult to distinguish the peritoneum, on account of old and recent adhesions to the cæcum. Peritoneum was at last opened at upper angle of wound, and a finger introduced. Cæcum was found to form the outer wall of an abscess, the finger being able to sweep around it to the inner side towards and below the umbilicus, and downward on the outer side of the cæcum to Poupart's ligament. The peritoneal cavity was protected with sponges at upper end of wound, and cæcum carefully loosened from outer side at lower end. A cavity was entered below and to the inner side of the cæcum; it contained two or three ounces of stinking pus. The appendix could not be felt and was not removed. Drains surrounded by gauze were introduced into cavity, and wick drains up along the outer side of cæcum. Upper part of wound closed.

March 25.—Good drainage; quiet night; no vomiting; abdominal respiration; abdomen not distended; temperature, A.M. 100° F., P.M. 100 $\frac{2}{3}$ ° F.; pulse, A.M. 60, P.M. 55.

March 26.—Temperature, A.M. $100\frac{2}{5}^{\circ}$ F., P.M. $100\frac{2}{5}^{\circ}$ F.; pulse, 52. Patient given calomel, half a grain every hour, until ten doses were taken. Bowels moved at 11.10 A.M. very thoroughly.

March 27.—Temperature, A.M. $100\frac{1}{5}^{\circ}$ F., P.M. $100\frac{2}{5}^{\circ}$ F.

March 28.—Temperature, A.M. $99\frac{4}{5}^{\circ}$ F., P.M. $99\frac{4}{5}^{\circ}$ F.
One of the drainage-tubes removed.

March 29.—Temperature, A.M. $99\frac{3}{5}$, P.M. 100° F.

March 30.—Temperature, A.M. $99\frac{2}{5}^{\circ}$ F., P.M. $100\frac{3}{5}^{\circ}$ F.

March 31.—Temperature, A.M. 99° F., P.M. $99\frac{4}{5}^{\circ}$ F.

April 1.—Temperature, A.M. $99\frac{2}{5}^{\circ}$ F., P.M. $99\frac{3}{5}^{\circ}$ F.

April 2.—Temperature, A.M. $99\frac{3}{5}^{\circ}$ F., P.M. $99\frac{4}{5}^{\circ}$ F.

April 7.—Wound looks healthy; bowels open.

April 10.—Drainage-tube removed.

April 12-16.—Wound granulating nicely.

April 28.—Patient discharged cured.

CASE NO. 13.

George K., sixteen years of age. Appendicitis with perforation and local abscess, laparotomy, recovery.

Patient has during the last ten weeks had three attacks of appendicitis, beginning with acute pains, fever, vomiting, and malaise, lasting several weeks. Present attack commenced on January 18, 1896, and the pains became localized in right ileocæcal region. He has complained of a continuous pain, been constipated, had vomiting and anorexia. Treatment had consisted in anodynes, poultices, and enemata. I was called in consultation on January 23, the fifth day of the disease. Temperature was 102° F., pulse 108, respiration 22; rigidity over right ileocæcal region, left side normal. Hard, deep infiltration, moderate meteorism.

Laparotomy by four-inch incision through the muscles. Omentum presented itself adherent to cæcum and anterior

abdominal wall. It was loosened laterally, and an abscess opened lying below cæcum, extending somewhat upward behind cæcum and a coil of intestines. Omentum formed anterior wall. Old, strong adhesions everywhere. About four ounces of pus flowed out. Appendix could not be discovered; cavity thereupon disinfected; wick drain introduced, and four silkworm-gut sutures applied.

Evening temperature 100° F., pulse 84, respiration 22; copious exudation through drain.

January 24.—Temperature 99.2° F., pulse 80, respiration 22; no vomiting; condition favorable.

January 25.—Pulse and temperature normal; five times large evacuation after calomel and sulphate of magnesia.

January 26.—Drain removed and a smaller one introduced.

January 27.—Patient complained of pain in left femur and leg, and was unable to move the limb. He had some fever in the evening, his temperature being 100° to 101° F.

February 2.—Patient continued to complain of pain in the leg, and the evening temperature was 101° F. There was felt a swelling, with hardness and tenderness, along the whole femoral vein; no swelling of the foot. Left iliac region normal.

R Ungu. jodid. potass.,
 Ungu. belladonnæ, āā $\frac{3}{4}$ ss;
 Ungu. plumbi acet., $\frac{3}{4}$ i.
 Mds. Externally.
 Cat. emol.

February 9.—For the last three days normal pulse and temperature. No pain along femoral vein, but it felt like a hard string down almost to Hunter's canal; good appetite. The drain was removed and the wound was found almost healed.

February 12.—Wound healed; no pain or tenderness

in left femur, although there was still felt some thickness along femoral vein. E. L. with abdominal support.

March 1, 1896.—Discharged recovered.

CASE NO. 14.

Lillian M., Niagara Falls, New York, bookkeeper, age nineteen years. Appendicitis with perforation and local circumscribed abscess, laparotomy, recovery.

Family history unimportant. In December, 1894, the patient was seized with severe pain in the right inguinal region. Pain lasted about two days, and was not of sufficient importance to call a surgeon. No return of pain until April, 1896, when patient went through a similar experience as in 1894, with the exception that the pain was more severe. This attack lasted two days, and, as in the previous case, was accompanied by some emesis. The pain in both these instances was spasmodic in character, always localized and limited to the right inguinal region. On April 10, 1896, pain returned and was more severe in character. Emesis, chills; temperature 103° F., pulse 96; tongue coated, constipation, and all the symptoms of fever.

Abdomen on inspection: some tympanites present; a fulness was noticed in right iliac region. On palpation: tenderness in the right inguinal region, especially at McBurney's point; tenderness was localized.

Pulse from April 10 to April 16 varied from 90 to 96. Temperature during same period varied from 101° to 103° F. Bowels were constipated and required the use of laxatives and enemata.

On April 16 patient had a severe chill, which lasted twenty minutes. Pulse gradually increased until April 20, at which date it was 115, temperature 104° F. I was called in consultation to Niagara Falls on April 20. At

the examination a hard mass was felt occupying the whole ileocæcal region, reaching down to Poupart's ligament; dull percussion over the whole region. No pain or tenderness in the retrocæcal region.

Extraperitoneal incision was first made, but pus could not be found, and the finger inserted behind the peritoneum met the same hard, infiltrated mass in front.

The incision was sutured and laparotomy performed by a four-inch incision, two inches inside of the anterior superior iliac spine through the muscles. It was very difficult to recognize the peritoneum, it being strongly adherent to the intestines all around. The adhesions were carefully loosened along the outer and lower end of cæcum and a small abscess opened on the inner side of the cæcum. It contained one ounce of stinking pus and a coprolite as large as a bean. The appendix could not be felt and was left undisturbed. A drain was introduced in a curve around the lower end of the cæcum, the cavity washed out, and the rest of the wound closed by sutures.

April 21.—Temperature 101° F., pulse 122.

April 22.—Temperature 98° F., pulse 104.

April 23.—Temperature 98° F., pulse 84.

April 24.—Temperature 98° F., pulse 96. Wounds were dressed. Amber-colored fluid escaped from drainage-tube. Wound was well irrigated with sterilized water and iodoform gauze dressing applied.

April 25.—Temperature 99° F., pulse 100. Wound was dressed, when fecal matter was discovered escaping from tube.

April 26.—Temperature 100° F., pulse 104.

April 27.—Temperature 100° F., pulse 96.

April 28.—Temperature 102° F., pulse 120.

May 15, 1896.—Dressing has been done every eight

hours since. On this date stitches were removed, small drainage-tube substituted, hardly any fecal matter escaping from the tube. Patient's appetite good. Pulse and temperature normal.

July 31.—Patient called at my office. Feels well and healthy, no hernia, strong retracted scar.

CASE NO. 15.

Mr. L. W., student, Toledo, Ohio, aged seventeen years. Appendicitis with perforation and local circumscribed abscess, laparotomy, recovery.

Patient had never had a previous attack, although he had had pains in right iliac region. Was taken sick May 21, 1896, with pains in right iliac region, accompanied with chills, fever, and vomiting. On the following day (May 22) he was given cathartics and had passages from the bowels.

May 22.—Temperature, evening 102° F.

May 23.—Temperature, A.M. 103° F., P.M. 104° F.

May 24.—Temperature, A.M. 102° F., P.M. 103° F.

May 25.—Temperature, A.M. 102° F., pulse 108.

I was called in consultation May 25. Upon examination found tenderness in right iliac region, most marked over McBurney's point. Abdominal distention; hardened mass in same region; prominence of superficial abdominal veins; abdominal respiration; pulse 108.

May 25.—Under chloroform, laparotomy. An incision four inches long was made midway between anterior superior spine and outer border of rectus muscle to outer side of swelling. Structures divided and a circumscribed intra-peritoneal abscess found. Pus evacuated and cavity irrigated; drainage-tube introduced and antiseptic dressings applied. The abscess contained about sixty grammes of stinking pus, mixed with air. No concretions were seen

and the appendix could not be felt in the circumscribed abscess. The abscess was lying on the lower and inner side of the cæcum, and a drain was introduced in a curve around the lower end of the cæcum.

May 30.—Patient doing well. Pulse and temperature normal; bowels open.

June 3.—Tube removed and wound allowed to close.

June 10.—Still a fistula left, with slight secretion of pus. Tube introduced.

June 16.—Patient up and around.

June 21.—Patient discharged cured.

CASE NO. 16.

Harry W., thirty years of age, mechanic. Appendicitis with perforation and local abscesses, laparotomy, recovery.

Patient gives no history of previous attacks. He was taken sick a week before his admission to hospital with pains in the back of chest. The next day had severe pain in the right iliac region, without vomiting. Cathartics were given, keeping bowels open three or four times a day. Patient sent to Sisters' Hospital on June 10, 1896, for operation.

June 10.—No movement of bowels. Temperature $102\frac{2}{5}^{\circ}$ F., pulse 96. Tongue coated. Upon examination found both thighs flexed upon abdomen; marked rigidity of abdominal muscles over right iliac region. Diminished abdominal respiration. On account of extreme tenderness could not palpate appendix; no tenderness in left iliac region. Under chloroform narcosis an incision three inches long was made through abdominal muscles, about one inch inside anterior superior spine of ilium. The peritoneum was incised and a circumscribed abscess found extending upward on the outer side of cæcum and downward into the pelvic region. Abscess contained about six

ounces of stinking pus, mixed with air. The appendix was not found in cavity, and it was deemed inadvisable to attempt to remove it. The cavity was thoroughly irrigated with sterilized salt solution and peroxide of hydrogen. No concretions were found. Two rubber drainage-tubes were introduced, one upward and the other down towards pelvis, around lower edge of cæcum. The margins of wounds above and below the drains were sutured and antiseptic dressings applied.

June 10.—Temperature, A.M. $102\frac{2}{5}^{\circ}$ F., P.M. $102\frac{3}{5}$ F.; pulse, A.M. 85, P.M. 90.

June 11.—Temperature, A.M. $100\frac{3}{5}^{\circ}$ F., P.M. $98\frac{1}{2}^{\circ}$ F.; pulse, A.M. 78, P.M. 90.

June 12.—Temperature, A.M. $98\frac{1}{2}^{\circ}$ F., P.M. $98\frac{1}{2}^{\circ}$ F.; pulse, A.M. 74, P.M. 84.

After this, temperature normal.

The third day after operation it was noticed that fecal matter was being discharged through wound. This continued to be discharged for about a week.

June 25.—Drainage-tube extending up towards liver removed and iodoform gauze packed in its place. Discharge lessening.

June 27.—Drainage-tube extending down towards pelvis removed and iodoform gauze put in its place. Discharge nearly stopped. Wound granulating nicely from the bottom.

July 9.—Wound entirely healed, and patient allowed to get out of bed with abdominal support.

July 10.—Patient discharged cured.

CASE NO. 17.

W. P. B., aged fifty-three years. Appendicitis with perforation and local abscess, laparotomy, recovery.

Eight years previous to admission to hospital patient

was taken suddenly with severe pain in right iliac region. This pain was constant, sharp, and severe, and was increased by pressure. He was very much constipated, but had no vomiting. This attack confined him to bed for four days. Two years later patient was shovelling snow when he was seized with severe pain in right iliac region, which was similar to previous attack, except that it was more severe and lasted longer, patient being confined to bed for a week. During the two years between first and second attacks patient complained of constant pain in right iliac region. Four years ago patient had third attack similar to former ones, only being more severe and confining him to bed longer. August 16, 1896, patient was sitting at home reading a paper when he was suddenly taken with cramps in abdomen. Thought if he took a walk it would pass off, so he walked to his sister's home. This did not relieve the pain, but it became more severe, and he took the car home. When he reached home he was in agony and sent for a physician, who gave him a hypodermic of morphine and pronounced it colic. He rested quietly that night and next day, but on the following day he was taken with severe pain in right iliac region, radiating upward on right side to hypochondriac and lumbar regions, causing shortness of breath. Patient sent for his family physician, who gave him salts and castor oil, which kept bowels open, and ordered hot applications over seat of pain. He also gave him some medicine for nervousness. Under this treatment patient seemed to be doing nicely. The hard, indurated swelling in right iliac region which had appeared had seemingly nearly all disappeared by August 26, and patient was so much improved that hot applications were discontinued. During night of August 26 patient got worse; swelling in right iliac region reappeared.

August 27.—As the patient had grown much worse, I was called in consultation in the afternoon. Found the patient's temperature 102° F., pulse 74. Found a hard infiltration in ileocaecal region, reaching upward to line between anterior superior spine of ilium and umbilicus, inward to outer border of rectus, and downward almost to Poupart's ligament. Great tenderness, particularly over McBurney's point. Tympanites on percussion over tumor. Ordered elixir opii (McMunn's), fifteen minims every three hours. Ordered cathartics stopped.

August 28.—Temperature, A.M. 101° F., P.M. $101\frac{1}{2}^{\circ}$ F.; pulse, A.M. 74, P.M. 76. Infiltration increasing inward and downward, and slightly protruding.

August 29.—Temperature 101° F., pulse 75. Infiltration still increasing. Slight œdema of skin, which reaches down to outer third of Poupart's ligament. Tongue moist. Heart slightly irregular. I advised removal to Sisters of Charity Hospital for operation.

August 29, 1 P.M.—Patient arrived at hospital. Temperature $99\frac{3}{5}^{\circ}$ F., pulse 72, tongue moist. Examination revealed as has been described above. At 3 P.M. gave morphine one-fourth grain, atropine one hundred and fiftieth grain, strychnine one-thirtieth grain.

Under ether narcosis at 3.30 P.M. an incision three inches long, just above and parallel to Poupart's ligament, was made (extraperitoneal), but no pus was found; only a large, indurated mass could be felt in front and inward. This incision was closed and another made about two inches inside the anterior superior spine, over indurated mass. Tissues were severed; peritoneum reached; small opening made, when a large quantity of thick, stinking pus spurted through opening. Upon introducing finger into opening a circumscribed cavity the size of a goose-egg was found filled with pus. This cavity extended

inward and upward along inner side of cæcum. Pus was evacuated; cavity irrigated; rubber drainage-tube inserted upward towards cæcum and wound dressed antiseptically. After operation patient rallied nicely. Temperature $99\frac{3}{5}^{\circ}$ F., pulse 72.

August 30.—Patient doing nicely. Expression good; very little pain; wound dressed at ten A.M., three and six P.M.; each time found some discharge of pus. Urinated at three P.M. Temperature, A.M. 100° F., P.M. 100° F.; pulse, A.M. 75, P.M. 84. Examination of blood before operation showed large number of polynuclear cells.

August 31.—Patient resting; slept well. Temperature, A.M. 98.6° F., P.M. 99° F.; pulse, A.M. 74, P.M. 88.

September 1.—Temperature, A.M. $98\frac{1}{2}^{\circ}$ F., P.M. 100° F.; pulse, A.M. 72, P.M. 80.

September 2.—Temperature, A.M. $98\frac{1}{2}^{\circ}$ F., P.M. 100° F.; pulse, A.M. 72, P.M. 80.

September 3.—Temperature, A.M. $100\frac{2}{5}^{\circ}$ F., P.M. $99\frac{2}{5}^{\circ}$ F.; pulse, A.M. 80, P.M. 72. Patient was given one ounce oleum ricini; bowels moved three times.

September 4.—Temperature, A.M. 99° F., P.M. $102\frac{2}{5}^{\circ}$ F.; pulse, A.M. 74, P.M. 100.

September 5.—Temperature, A.M. $98\frac{3}{5}^{\circ}$ F., P.M. 99° F.; pulse, A.M. 72, P.M. 74. Patient very well. Discharge of pus stopped; induration rapidly disappearing.

September 6.—Temperature, $98\frac{1}{2}$ – 99° F., pulse 72–74.

September 9.—Drainage-tube removed; wound healthy, granulating.

September 12.—Wound healed. Patient discharged recovered.

CASE NO. 18.

John K., twenty-eight years of age, railroad fireman. Appendicitis with total gangrene, without perforation, laparotomy, recovery.

The patient complained suddenly on the 17th of February, 1895, of serious diarrhœa, without any known cause. The diarrhœa continued to the 19th, when he complained of a pain in the right ileocæcal region. Frequent vomitings occurred on the 20th, on which day the diarrhœa ceased, and the bowels had not moved since. A severe chill occurred on the 21st, followed by high fever, and a second chill on the 22d, while vomiting continued without being of fecal odor. I was called in on the 22d, late at night, and found the patient with a temperature of 103° F., pulse 110. The abdomen was intensely tender, the muscles rigid, particularly on the right side. Light meteorism was present, and the respiration was partly costal. The pains were so severe that no exact examination could be made, and I therefore had the patient removed to the Sisters of Charity Hospital in the hospital ambulance. Living eight miles from the hospital he arrived late at night.

February 23.—Laparotomy was performed early in the morning, by aid of an oblique incision through the muscles, four inches long, and about two inches inside anterior superior spine of the ilium. The peritoneum having been opened, there was a discharge of about ten ounces of sero-purulent fluid, mixed with fibrinous membranes, and both the intestines and the peritoneum were found seriously congested. The appendix was found with some difficulty. It extended upward and inward, was five inches long and one inch broad, and perfectly black and gangrenous, with the exception of a small edge along the insertion of the short mesentery. A concrement as large as the last joint of the finger was found in the appendix, which was covered by a coil of intestine. Between the appendix and this coil of intestine was found about one-half ounce of stinking pus, well limited by adhesions.

The appendix was amputated and the cavity disinfected with peroxide of hydrogen. I made a median incision and introduced a thick aluminum drain to the bottom of Douglas's fossa, through which the peritoneal cavity was thoroughly irrigated with sterilized salt solution. A rubber drain surrounded by iodoform gauze was then introduced through the lateral incision, up to the stump, the wound partly sutured, and sterilized dressings applied. R Calomel one grain, soda two grains, every half-hour till ten powders had been used.

February 24.—Temperature, A.M. 100° F., P.M. 99° F.; pulse, A.M. 88, P.M. 88; respiration, A.M. 18, P.M. 18. Two ounces of sero-sanguinolent fluid were pumped out through the median drain during the previous twenty-four hours; occasionally still light-greenish vomiting; several times fluid movements.

February 25.—Normal temperature and pulse. The median drain removed; the lateral drain cleansed and replaced.

February 28.—Patient feels well. Normal pulse and temperature. General diet.

March 5.—Lateral drain removed. The wound healthy and superficially granulating.

March 16.—Patient discharged with abdominal bandage.

August 12.—Patient is healthy and works as railroad conductor; scar healthy without rupture.

CASE NO. 19.

Harry W., seventeen years of age, student. Appendicitis with gangrene, without perforation, laparotomy, recovery.

The patient, who formerly had always enjoyed good health, complained on the 25th of April, 1895, of general malaise. Pains appeared in the abdomen, of indistinct

character, towards the evening, and increased during the 26th of April, after the administration of one-half ounce of sulphate of magnesia. The pains became localized on the 27th of April in the right ileocæcal region, with pronounced meteorism, continual vomiting, and obstinate constipation. I was called in consultation the same evening. Temperature was then 103° F., pulse 116. There was intense tenderness over the whole abdomen, most pronounced in the right iliac region. Costal respiration, muscular rigidity, but without pronounced swelling. Suffering expression.

I sent the patient to the Sisters of Charity Hospital, and performed laparotomy on his arrival there. Oblique incision through the muscles four inches long. The appendix was found lying on the inner side of the cæcum, extending in a curve upward, with the tip agglutinated to the cæcum. The distal end was gangrenous, but still not perforated, and surrounded by about two drachms of pus, which was not limited by adhesions. The gangrenous part contained a large concrement. There was no exudation in the pelvis and no symptoms of diffuse peritonitis. The appendix was amputated and the stump disinfected with peroxide of hydrogen. A wick drain was introduced down to the stump; the wound was sutured. Sterilized dressings. R Calomel one grain, soda two grains, every hour.

April 28.—The patient had a good night and was feeling much better. Temperature 99½° F., pulse 92. No vomiting; abdominal respiration. Several times movements of bowels.

May 9.—Dressing changed and a smaller tampon introduced. Temperature and pulse normal.

May 14.—Patient discharged recovered, with abdominal support. Has been well since.

CASE NO. 20.

John K., sixteen years old, school-boy. Appendicitis with gangrene, without perforation, laparotomy, recovered.

The patient had for two weeks complained of slight pains in the ileocæcal region, and indigestion. He had kept his bed for two days, had had fever, and vomited repeatedly, and the pains had increased considerably. A physician sent him on the 25th day of May, 1895, to the Sisters of Charity Hospital for operation. Considerable rigidity of the abdominal muscles on the right side was found at the examination, and considerable pain in the right ileocæcal region, where a hard and deep-seated swelling was felt over the appendix. The patient was somewhat exhausted; the temperature was $103\frac{1}{2}^{\circ}$ F., the pulse 110.

Laparotomy was immediately performed, with a four-inch long oblique incision over the swelling. The appendix was found surrounded with fresh adhesions, was totally gangrenous, but not yet perforated, and was lying outside of the cæcum in about two ounces of stinking pus. It was amputated, and the cavity disinfected and lightly plugged with iodoform gauze. Sterile dressing. Sulphate of magnesia ordered.

May 29.—Pulse and temperature normal. The dressings changed.

June 13.—The wound is healed. Patient discharged recovered, with abdominal support.

CASE NO. 21.

W. K., ten years of age, school-boy. Appendicitis with gangrene, but without perforation, laparotomy, recovery.

The patient had formerly had two light attacks with

pain in the ileocaecal region. He complained on August 26, 1895, in the evening, of severe pain in the abdomen; frequent vomitings and slight fever. I was called in consultation, August 27, in the evening. The patient had then a pulse of 130, temperature $100\frac{1}{2}^{\circ}$ F. Vomitings had ceased. At the examination, some local tenderness was discovered by deep pressure over McBurney's point, and an indistinct swelling of the appendix was felt, but there was no rigidity of the muscles; respiration was abdominal, and the condition, with the exception of the pulse, was on the whole favorable. The disease was considered to be catarrhal appendicitis rather than a serious inflammation, and light physic was therefore ordered. I saw him early next morning, August 28. He had had a restless and sleepless night; had a severe chill early in the morning, the temperature was 103° F., pulse 130, and there was now slight rigidity of the muscles over the right ileocaecal region. The respiration was still abdominal, and a swollen and tender appendix was distinctly felt by light examination.

I immediately performed a laparotomy, with the usual oblique incision, three inches long, through the muscles. The appendix was found as thick as a man's little finger, spiral, or shaped like a snail-shell, and lying below the caecum. It was covered here and there with fresh exudations of lymph, under which the serous membrane appeared grayish-black from commencing gangrene. The appendix was amputated, the stump disinfected, and a gauze wick introduced down to the stump. The wound was not sutured. The appendix contained a teaspoonful of stinking pus without concretions. It was five inches long, the last two inches being bulb-shaped, distal to a stricture. The mucous membrane and all the coats were gangrenous, but still without perforation.

R Calomel one-half grain, soda one grain, every hour. The evening temperature was 100° F., pulse 92. The patient had no pain, and had not vomited.

September 1, 1895.—The patient had steadily improved. The pulse and temperature had been normal for the previous two days; bowels had moved without physic. The dressings were changed; the wick tampon was removed with some difficulty, on account of adhesions to the stump. The patient complained of pains around the umbilicus, and screamed aloud, by which the adhesions were ruptured and a coil of bowels prolapsed. It was replaced, and the wound plugged lightly with iodoform gauze.

September 5.—Normal pulse and temperature. The wound granulating.

October 4.—The wound healed. Patient discharged, with abdominal support.

CASE NO. 22.

Eugene P., thirty years of age, civil engineer. Appendicitis with commencing gangrene, without perforation, laparotomy, recovery.

The patient during the previous three years had had periodical attacks of severe pains in the abdomen, generally occurring every third month. He had, however, had no attack during the previous six months. On October 21, 1895, he suddenly experienced severe colicky pains in the umbilical region, which were not alleviated by poultices. A physician was called in on October 22, and found the whole abdomen tender, but the pain most pronounced in the ileocaecal region. He ordered rest, absolute diet, and morphine. I was called in consultation on October 23. The temperature was then 100° F., pulse 108, respiration 18, and abdominal. Pronounced

rigidity of the abdominal muscles was found over the cæcal region. The left side was still normal, although tender on pressure. As the symptoms indicated appendicitis with perforation and commencing local abscess, or possibly gangrene, I had the patient transported to the Sisters of Charity Hospital, and there immediately performed laparotomy by aid of an incision three inches long through the muscles. The appendix was found agglutinated to an overlying coil of intestines, but still without pus in the neighborhood. It extended straight downward towards the pelvis, and then turned upward in an acute angle, parallel with the upper half, so that the tip was agglutinated to the cæcum. The lower half was intensely congested, thickened, and indurated, and the tip was gangrenous, but still not perforated. The mesentery was enormously thickened and retracted. The appendix was amputated and the stump invaginated after Dawbarn's method. An impermeable stricture was found at the angle, and the appendix on the distal side of this was full of pus, and the mucous membrane gangrenous. The gangrene extended in several places to the serosa, where it appeared as black spots. The wound and the stump were thoroughly disinfected with peroxide of hydrogen, and the wound was sutured without drainage.

R Calomel one-half grain, soda two grains, every half-hour; thereafter sulphate of magnesia one-half ounce.

October 24.—Temperature, A.M. 98° F., P.M. 98° F.; pulse, A.M. 90, P.M. 86; several times free, thin motions. Fluid diet.

October 25.—Temperature 98½° F., pulse 84. Feels well. General diet.

November 4.—Discharged recovered, with abdominal support.

CASE NO. 23.

John B., aged fourteen years. Appendicitis with gangrene, without perforation, laparotomy, recovery.

The patient had during the previous three months had three serious attacks of colicky pains, which commenced in the ileocæcal region and lasted several hours. He complained on the 28th of October, 1895, of severe diarrhœa, after having eaten a large amount of grapes. The diarrhœa ceased and his bowels were not moved again until October 31, when he had a new attack of colicky pains, followed the next day (November 1) by a similar attack, which this time was continuous and accompanied with vomiting. The pain increased on November 2 to an unbearable degree, and the vomiting recurred. A physician ordered injections of morphine, and, as he did not improve, sent him to the Sisters of Charity Hospital for operation on November 3. At the examination I found the temperature 100° F., pulse 120, respiration 26, partly costal. There was pronounced rigidity of the muscles over the right iliac region, with a tenderness so intense that palpation could not be made. As the symptoms indicated gangrene, I immediately performed laparotomy, making an oblique incision three inches long through the muscles. The appendix was found curved downward and outward; was about three inches long, and perfectly gangrenous in the outer two-thirds. It was covered by a coil of intestines, and about half an ounce of pus was found in the neighborhood, limited by adhesions. The appendix contained two large concretions, in the centre of which a small grape-seed was found. The mesentery was much shortened, and covered only the inner third of the appendix. The appendix was amputated, the abscess disinfected with peroxide of hydrogen, the abdominal cavity irrigated

with normal salt solution. An aluminum drain was introduced to the bottom of Douglas's fossa, as a matter of safety, and a wick of sterilized gauze surrounded with protective to the stump. The wound was partly sutured with silkworm gut. R Calomel one-fourth grain, soda one grain, every hour for eight hours; thereafter sulphate of magnesia two drachms every second hour till action.

November 4.—The patient tore out the aluminum drain and it was not replaced. Temperature, A.M. 99° F., P.M. 100° F.; pulse, A.M. 102, P.M. 95; respiration, A.M. 42, P.M. 32. He had during the morning several times greenish vomiting, also copious movements towards evening. The abdomen was thereafter soft, without pain or meteorism. Fluid diet.

November 5.—Temperature 98 $\frac{3}{4}$ ° F., pulse 82, respiration 20, abdominal. Patient felt well.

November 6.—Temperature normal, pulse 72, respiration 21. The gauze wick was removed and a mesh of iodoform gauze introduced.

He was discharged recovered two weeks later, with abdominal support.

CASE NO. 24.

John C., aged thirty-nine years, engineer. Appendicitis with gangrene, without perforation, laparotomy, recovery.

The patient took cold on October 31, 1895, and complained of a pain in the throat, chest, and abdomen. He suddenly experienced on November 2 severe pains in the abdomen, in the ileocæcal region. He had the day before taken a purgative, which was followed by three copious movements. A physician was called in on November 3 during the night, as the patient continued to have unbearable pains in the abdomen. He ordered morphine and enemata. I was called in consultation on November 4,

and found the patient with moderate fever. Temperature 100° F., pulse 86, respiration 18. There was some rigidity of the muscles over the cæcal region and intense tenderness by palpation. The patient's brother-in-law died of appendicitis two years previously, and he, therefore, himself insisted upon early operation. He was, consequently, transported to the Sisters of Charity Hospital.

November 5.—The patient's condition was much improved; pulse and temperature normal; no rigidity of the abdominal muscles, but still considerable tenderness by deep palpation. An indurated, swollen appendix, as large as a little finger, felt with ease, was found extending down towards the pelvis. Laparotomy was performed with a two-inch-long incision in the right semilunar line. The appendix was found covered by the omentum, to which it was agglutinated with fresh adhesions. It extended downward towards the pelvis, was bulb-shaped, swollen, and dark-gray in spots, from beginning gangrene. It was amputated and invaginated after Dawbarn's method, and the wound closed by rows of sutures. The appendix contained a narrow stricture near the cæcum, on the distal side of which it was bulb-shaped and contained a small fecal concrement and a little stinking pus. The mucous membrane was completely gangrenous, and the gangrene extended here and there out to the serous membrane, but still without perforation.

November 26.—Temperature 99° F., pulse 72. No vomiting or pain. Hunyadi Janos water till action.

Discharged recovered two weeks later.

CASE NO. 25.

Edward K., nineteen years of age, butcher. Appendicitis, with ulceration and beginning gangrene, laparotomy, recovery.

Patient had had attacks of severe pain in right side every three or four months for past four years, but was never confined to bed, although he would be unable to work for a week after such attacks. Patient was taken suddenly ill July 15, 1896, about ten P.M., with severe pain in right iliac and lumbar regions, which radiated through chest. After the administration of a blue pill and some castor oil he had two good movements of the bowels, but this did not relieve him, and he grew rapidly worse, so that after twenty-four hours, when a physician was called in, about nine P.M., July 16, his temperature was 100° F. and pulse 140. I was immediately called in consultation, arriving at patient's house at ten P.M. Found patient more comfortable, with pulse of 120, after use of morphine hypodermically. There was no meteorism and no vomiting. Over the ileocæcal region there was found retraction of abdominal muscles. There was so much tenderness in this region that no examination could be made. Left iliac region not tender upon pressure. The symptoms, particularly the rapid pulse, pointed towards perforation of appendix. Patient was therefore taken at once to Sisters of Charity Hospital for immediate operation, and was operated upon at twelve P.M.

Laparotomy.—Under chloroform narcosis, a three-inch incision was made through the sheath of rectus muscle, near its outer margin, muscle pulled inward and peritoneum incised. No exudation was found, and bowels and omentum looked perfectly healthy. Cæcum was carefully pulled out through incision and the appendix found lying up along its outer side, swollen and covered with fresh fibrinous exudations. The appendix was six inches long. It was dissected out with blunt instruments, cut off, and the stump invaginated after Dawbarn's method. Wound closed by rows of sutures and dressed antiseptically.

tically. The mucous membrane of appendix was found intensely congested and thickened, and towards the tip three small ulcerations were found extending to the peritoneal coat, but not yet perforated. The outer end was softened to such a degree that it was torn off during the manipulations. The appendix contained no concretions or fecal matter. One hour after operation the pulse was 96, temperature 100° F. Patient spent a very restless night; was given during night one-half grain morphine hypodermically.

July 17.—Patient was very uneasy and was given morphine hypodermically. Was catheterized. Complained of severe pain over abdomen and in back. No vomiting; no meteorism. Dressings removed. Wound all right. Dressings reapplied. Spent restless night. Temperature $100\frac{1}{5}^{\circ}$ F., pulse 96.

July 18.—Patient very uneasy, complaining of severe pain in left iliac region and back. No vomiting. No meteorism; gave him four grains calomel and one ounce Rochelle salts and an enema, and bowels moved freely several times, much to relief of patient. Temperature, A.M. $100\frac{3}{5}^{\circ}$ F., P.M. $99\frac{1}{5}^{\circ}$ F.; pulse, A.M. 100, P.M. 88.

July 19.—Patient resting very comfortably. Bowels freely open. Pain very much less. Temperature, A.M. $99\frac{3}{5}^{\circ}$ F., P.M. 100° F.; pulse, A.M. 104, P.M. 100.

July 20.—Patient slept well during night, resting very comfortably in morning. No pain. Takes food, milk, cocoa, etc. Temperature, A.M. $100\frac{4}{5}^{\circ}$ F., P.M. 100° F.; pulse, A.M. 100, P.M. 96.

July 20–26.—Patient improved every day. On 26th stitches removed. Wound healed by first intention, except small stitch abscess in lower end of wound.

July 29.—Patient allowed to get out of bed.

August 1.—Discharged, recovered.

CASE NO. 26.

Nellie M., twenty-six years of age, housemaid. Appendicitis with gangrene, without perforation, laparotomy, recovery.

Patient had never suffered from similar attacks, but had usually been constipated. On October 21, 1896, she worked hard washing and cleaning house. During that night she was taken suddenly ill with severe pains in the back, which next day, October 22, became fixed in the ileocæcal region and were very intense. Towards the evening a physician was called, who administered morphine hypodermically. She vomited frequently, and, as she was steadily growing worse, she was, on October 23, sent to the hospital. She was on her arrival strongly under the influence of morphine, which considerably masked the symptoms. She vomited about a pint of brownish-green fluid. Temperature 101° F., pulse 130, respiration 24, partly abdominal. No tympanites present. Marked rigidity of the abdominal muscles in the right ileocæcal region, with intense tenderness and indistinct hardness over McBurney's point.

Laparotomy, twenty-four hours after the appearance of the severe symptoms, by incision three inches long, in right semilunar line. No congestion of the small intestines. Around the cæcum was found a moderate amount of sero-fibrinous exudation, which was removed with sponges. The lower end of the cæcum was enormously thickened and immovable. The appendix was found to extend inward and downward and was covered with the lower end of the ileum. It was seen to be totally gangrenous around its insertion in a space as large as a quarter of a dollar. During the manipulations the gangrenous appendix was ruptured, with discharge of stink-

ing pus. The mesenteriolum, which was greatly thickened and retracted, was ligated, and the appendix ligated in the gangrenous part and removed. The gangrenous part of the cæcum and the stump of the appendix were invaginated into the cæcum with a few Lembert's sutures, and then covered with the mesentery of the nearest coil of the ileum, which was sutured around the invaginated part. The pelvis was thereafter irrigated with sterilized salt solution, as a matter of precaution; a glass drain containing a strip of dry gauze for capillary drainage was introduced to the bottom of the pelvis, and a wick drain down to the neighborhood of the appendix. The wound was partly closed by two silkworm-gut sutures, and covered with dry, sterilized gauze. Pulse immediately after the operation 96. The appendix was four inches long, the first inch being totally gangrenous. Between the inner and middle third there was a rather narrow stricture. The mucous membrane of the outer two-thirds was totally gangrenous and black, the gangrene reaching in spots to the serosa. There were no agglutinations to prevent irruption into the peritoneum.

October 24.—Slept most of the night; no vomiting. Dressings changed twice, as they were soaked through. No tenderness in left side. Temperature, A.M. 99° F., P.M. 100 $\frac{2}{5}$ ° F.; pulse, A.M. 98, P.M. 102; respiration 25.

October 25.—Feels well; no meteorism; dressings and capillary drain in tube changed twice. Temperature, A.M. 100° F., P.M. 98 $\frac{1}{2}$ ° F.; pulse, A.M. 120, P.M. 96. Glass drain removed. Milk diet.

October 26.—Temperature, A.M. 99 $\frac{2}{5}$ ° F., P.M. 99 $\frac{2}{5}$ ° F.; pulse, A.M. 88, P.M. 98. No abdominal tenderness or tympanites.

October 27.—Temperature, A.M. 99 $\frac{2}{5}$ ° F., P.M. 100 $\frac{1}{5}$ ° F.; pulse, A.M. 96, P.M. 104.

October 28.—Temperature, A.M. $99\frac{1}{5}^{\circ}$ F., P.M. $100\frac{2}{5}^{\circ}$ F.; pulse, A.M. 96, P.M. 104. Wick drain removed and rubber drain inserted. Oleum ricini, after which three large stools.

October 29.—Temperature, A.M. 100° F., P.M. $99\frac{1}{2}^{\circ}$ F.; pulse, A.M. 100, P.M. 96. Considerable discharge of fecal matter through the wound.

October 30.—Temperature, A.M. 100° F., P.M. 99° F.; pulse, A.M. 100, P.M. 96.

October 31.—Temperature, A.M. $99\frac{1}{2}^{\circ}$ F., P.M. $98\frac{1}{2}^{\circ}$ F.; pulse, A.M. 96, P.M. 88.

November 1.—Temperature, A.M. $98\frac{1}{2}^{\circ}$ F., P.M. $98\frac{1}{2}^{\circ}$ F.; pulse, A.M. 88, P.M. 88. Wound granulating; fecal discharge decreasing.

The discharge disappeared gradually. The wound healed by granulations, and the patient left the hospital recovered two weeks later, with abdominal bandage.

CASE NO. 27.

Mark C., aged seventeen years, teamster. Appendicitis with gangrene, without perforation, laparotomy, recovery.

Patient has never been confined to bed, but for the past month has had vague pains all over the abdominal region. On Saturday, November 28, 1896, he was seized suddenly with severe pain in right iliac region, radiating to the umbilicus, which gradually increased and was accompanied with vomiting on evening of November 29. A physician was called and prescribed for the vomiting. November 30, vomiting ceased and bowels moved freely. December 1 and 2, pain remained about the same. On December 3 he was removed to hospital. Examination showed a marked rigidity on right side, costal breathing, intense tenderness over McBurney's point. Bowels had moved freely on December 2 from cathartics. No vom-

iting at present. Temperature 100° F., pulse 96, respiration 20.

Laparotomy.—Incision three inches long, one inch inside anterior superior iliac spine, through muscles. As soon as the peritoneum was opened on the outside of the cæcum thick, yellow, fibrinous membranes were seen, circumscribing a little cavity containing a small amount of sero-purulent exudation. The lower end of cæcum was covered with these membranes and was intensely congested. The appendix was found extending straight down into the pelvis; it was six inches long, as big as a finger, gangrenous in spots, but not yet perforated, and walled in by adhesions, except on its outer half. It was amputated, and, as the inner half-inch was moderately healthy, it was invaginated after Dawbarn's method. Wound was disinfected by peroxide of hydrogen, and a rubber drain surrounded by iodoform gauze introduced to the bottom of the track of the appendix. Rest of wound closed by four silkworm-gut sutures. Appendix was six inches long; contained two strictures, one a half-inch from its insertion and the other a half-inch from its tip; between them the appendix was largely dilated, walls enormously thickened, mucous membrane ulcerated and gangrenous in spots, the gangrene extending to the serosa; the mesenterium enormously thickened. Peripherally to the outer stricture there was a slight dilatation of the appendix; no concretions were found.

December 3, P.M.—Temperature $100\frac{1}{2}^{\circ}$ F., pulse 96.

December 4.—Temperature, A.M. 99° F., P.M. $100\frac{1}{2}^{\circ}$ F.; pulse, A.M. 84, P.M. 98. Bowels moved after Epsom salts.

December 5.—Temperature, A.M. $99\frac{4}{5}^{\circ}$ F., P.M. $101\frac{1}{2}^{\circ}$ F.; pulse, A.M. 84, P.M. 88.

December 6.—Temperature, A.M. $100\frac{1}{2}^{\circ}$ F., P.M. $100\frac{1}{2}^{\circ}$ F.; pulse, A.M. 86, P.M. 88.

December 7.—Temperature, A.M. 98.6° F., P.M. 98.6° F.; pulse, A.M. 74, P.M. 72.

December 8–11.—Temperature and pulse normal.

December 11.—Wound dressed; drain removed; wound healing very nicely.

December 14.—Sutures removed. Wound dressed. Perfectly healed.

December 20.—Patient discharged cured.

CASE NO. 28.

Mrs. Maggie S., aged twenty-eight years. Appendicitis with gangrene, without perforation, laparotomy, recovery.

Eight and four months ago, respectively, patient suffered from severe attacks of pain in right iliac region which confined her to bed each time about a week. The attacks were treated for oöphoritis. Patient had been perfectly healthy since, until November 22, 1896, when she was suddenly taken ill with severe pain in the right iliac region, and that night she vomited considerably. She continued to vomit next day, and she grew rapidly worse. A physician was called, who found her temperature subnormal and pulse 110; great tenderness over McBurney's point and slight rigidity of muscles on right side. November 24 showed no improvement, but rather the patient was worse. He diagnosed appendicitis, and advised patient to go to Sisters' Hospital for immediate operation; following such advice, patient arrived at hospital at four P.M., November 25.

Examination showed temperature 100 $\frac{3}{5}$ ° F., pulse 132; extreme tenderness to pressure over McBurney's point; rigidity of muscles on right side; most severe pain by deep pressure on lumbar region. Under chloroform narcosis—

Laparotomy.—An incision three inches long was made through the outer part of sheath of rectus muscle, the

muscle drawn inward, and peritoneum incised. Cæcum was found and pulled out through wound. Appendix was found about four inches long, extending upward and outward. The inner two-thirds was normal, while the outer one-third was bulb-formed, slightly adherent, and totally gangrenous. A sero-purulent exudate of one ounce was found around the appendix. The appendix was loosened with some difficulty, on account of its deep situation; the mesentery, which was greatly thickened, was ligated and the appendix amputated and invaginated after Dawbarn's method. As there was a sero-purulent exudate in the neighborhood, it was thought best to irrigate the pelvis and the region on the outer side of the ascending colon with sterilized salt solution; also, as a measure of precaution, to introduce an aluminum drain to the fundus of the pelvis. The wound was thereafter closed by rows of sutures down to the tube, a strip of dry sterilized gauze inserted into the tube, and a large sterilized dressing applied. The appendix was found to contain an impassable stricture on the proximal side of the bulb-formed swelling; on the inner side of this stricture the appendix was found normal; on the outer side the mucous membrane was totally gangrenous, the gangrene reaching out to the peritoneal covering; there a piece as large as a five-cent piece was black and gangrenous, but not yet perforated. The appendix contained some stinking pus, but no concretions. Pulse, after operation, 118.

November 26.—Slept well. No vomiting. Temperature $99\frac{2}{5}^{\circ}$ F., pulse 104.

November 27.—Patient doing well. Slept well; no tenderness or tympanites; drain removed. Temperature, A.M. $99\frac{4}{5}^{\circ}$ F., P.M. 100° F.; pulse, A.M. 80, P.M. 96. Patient given light diet.

November 28.—Patient did not sleep during night. No

abdominal tenderness or tympanites. Temperature 99° F., pulse 80. Enema given, and bowels moved slightly.

November 29.—Temperature, A.M. 99° F., P.M. $99\frac{3}{5}^{\circ}$ F.; pulse, A.M. 72, P.M. 85.

November 30.—Temperature, A.M. 98.6° F., P.M. 98.6° F.; pulse, A.M. 72, P.M. 72.

December 1.—Temperature, A.M. 98.6° F., P.M. 99° F.; pulse, A.M. 72, P.M. 80.

December 2.—Temperature, A.M. 100° F., P.M. 99° F.; pulse, A.M. 80, P.M. 72.

December 3.—Temperature, A.M. 99° F., P.M. 101° F.; pulse, A.M. 72, P.M. 80. Patient improving rapidly. Vomited once after taking eggnog. Secretion from wound about stopped.

December 4.—Temperature and pulse normal.

December 5.—Temperature, A.M. 98.6° F., P.M. 100° F.; pulse, A.M. 68, P.M. 72. Small stitch abscess opened and two ounces of pus escaped. Drain inserted; slight pain. Patient slightly jaundiced.

December 6.—Patient rested very poorly; intense pain in back. Temperature, A.M. 98.6° F., P.M. $100\frac{3}{5}^{\circ}$ F.; pulse, A.M. 72, P.M. 84.

December 7.—Temperature, A.M. 101° F., P.M. 102° F.; pulse, A.M. 98, P.M. 84.

December 8.—Temperature, A.M. $99\frac{2}{5}^{\circ}$ F., P.M. 98.6° F.; pulse, A.M. 80, P.M. 96.

December 9.—Patient's eyes and skin again showing jaundice. R Sodium phosphate, twenty grains, every morning.

December 12.—Jaundice rapidly disappearing.

December 13.—Wound dressed. Abscess cavity almost closed.

December 19.—Wound healed. Patient discharged cured.

CASE NO. 29.

J. F. W., thirty-six years of age, civil engineer. Appendicitis with gangrene, without perforation, laparotomy, recovery.

Good family history. Patient has never had anything more serious than a heavy cold. On January 19, 1897, he slept in a hotel in Booneville in a very cold room and awoke with a heavy cold. After a hearty breakfast on January 20 he felt an uneasiness all over the abdomen. During the following night he had a severe pain in the region of the umbilicus, followed by vomiting and copious diarrhœa. He returned immediately to Buffalo, reaching there at 9 A.M., January 21. I was called in consultation the same evening by the family physician. There was then severe pain in the ileocæcal region, particularly over McBurney's point, and some muscular rigidity over the region. There was no pain or rigidity on the left side and no symptoms whatever of tympanites. A hard lump as large as two fingers was felt in the right ileocæcal region, intensely tender to pressure. His pulse, which normally was 61, was 90. Temperature 101° F., respiration abdominal. I advised immediate operation, and it was performed an hour later at Sisters' Hospital. Under chloroform narcosis, laparotomy by three-inch incision through the sheath of the right rectus muscle. The cæcum was pulled out and the appendix found with ease, covered with a piece of thickened and inflamed omentum as large as a silver dollar and resting under it as under a lid. The appendix was loosened, its mesenterium tied off, and the appendix then amputated one-half inch from the cæcum, and invaginated after Dawbarn's method. The inflamed piece of omentum covering the appendix was also ligated and removed. The wound was closed by rows of catgut

sutures. The appendix was totally gangrenous except its inner inch, was five inches long, and contained a concrement as large as a bean and a narrow stricture near the healthy part. Its lumen was greatly enlarged; it contained some stinking, sero-feculent material, about one-half ounce, and the concrement mentioned. The mucous membrane was totally gangrenous, the gangrene reaching out to the serous membrane, which was not yet perforated. The patient rested well during the night, vomited once.

January 22.—Temperature, A.M. $99\frac{3}{4}^{\circ}$ F., P.M. 99° F.; pulse, A.M. 78, P.M. 72. No pain or distention.

January 23.—Temperature, A.M. $98\frac{4}{5}^{\circ}$ F., P.M. $98\frac{1}{2}^{\circ}$ F.; pulse, A.M. 72, P.M. 72.

January 24.—Temperature $98\frac{3}{4}^{\circ}$ F., pulse 70. Slight distention by gas. Free movements of the bowels after sulphate of magnesia. Patient somewhat jaundiced, very drowsy, and slightly delirious. During the night he was very noisy and delirious, which symptoms were ascribed to a dose of sulphonal.

January 25.—Temperature, A.M. $100\frac{4}{5}^{\circ}$ F., P.M. 101° F.; pulse, A.M. 76, P.M. 76. Continues in a state of somnolence; the jaundice has increased, so that he is completely yellow. Incontinence of urine and fæces. R Sodium phosphate \mathfrak{zss} , infusion of hops $\mathfrak{z}\mathfrak{i}$, every three hours, and strychnine sulphate grain $\frac{1}{60}$, hypodermically, every four hours.

January 26.—Temperature $101\frac{2}{5}^{\circ}$ F., pulse 78. Patient completely delirious and very restless. Food given every two hours through catheter passed through the nose. It consists of panopeptone $\mathfrak{z}\mathfrak{i}$, milk $\mathfrak{z}\mathfrak{ii}$, water $\mathfrak{z}\mathfrak{ii}$.

January 27.—Was very restless during night, but somewhat improved to-day. Temperature $100\frac{1}{2}^{\circ}$ F., pulse 78. Was given three steam-baths in bed, after which profuse perspiration.

January 28.—Complained of pain in abdomen after vomiting. It was discovered that the wound had opened and that about sixteen inches of the small intestines had protruded and were lying under the bandage. Under chloroform the intestines were reduced and the wound was closed again with five silkworm-gut sutures. A small drain was left in lower angle of the wound. Slight tympanites during the day, which disappeared when the bowels had moved after administration of sulphate of magnesia.

January 29.—Still delirious; no tympanites. Temperature 99° F.

January 30.—Stools clay-colored. Temperature 98.6° F.

January 31.—No apparent change. Temperature 98.6° F., pulse 64.

February 1.—Mind clearer. Stools still clay-colored. Urine filled with bile pigment. Bowels moved freely. Temperature normal. He takes food by mouth again.

February 2.—Stools bile-tinged; three stools after Carlsbad water.

February 4.—Jaundice disappearing; mind still somewhat cloudy.

February 8.—Rapidly recovering. Wound healed. Left hospital in ambulance for his home.

February 20.—Perfectly recovered.

CASE NO. 30.

E. F., twenty-eight years of age, merchant. Appendicitis with gangrene, without perforation, laparotomy, recovery.

February 20, 1897, I was called to Java, New York, to see the patient, and learned there the following history from his physician: Patient had always been enjoying good health. Had noticed a tendency towards constipation

during the last half-year. He was taken on February 13, 1897, with severe pain on the right side of the abdomen, followed by vomiting and fever. The next day, February 14, the pain was most pronounced over, and especially above, McBurney's point. Temperature was 103° F., pulse 110. Fluid diet and morphine were ordered. On February 16 it was noticed that there was considerable tenderness along the lower end of cæcum, above the line from anterior superior spine of the ilium to the umbilicus, but no induration or swelling could be felt. Bowels had moved after physic. On February 17 an indistinct, rather oblong induration was noticed extending from McBurney's point upward and outward between crista ili and the ribs. The patient continued to have fever, between 101° and 103° F., pulse between 96 and 106, and the infiltration became more marked and tender to pressure. At the examination late at night on February 20, I found his temperature 101° F., pulse 96, respiration 18, abdominal. Slight meteorism of abdomen with great tenderness over upper part of right ileocæcal region, beginning at McBurney's point. An indistinct swelling was felt, extending from McBurney's point upward and outward, the swelling being about three inches long and one inch broad, and intensely tender to pressure. There was no muscular rigidity in the ileocæcal region proper; there was no swelling nor tenderness to deep pressure here, neither could the appendix be palpated. There was no swelling in the lumbar region, although some tenderness was present here on deep pressure. The history pointed towards an appendicitis in an appendix extending upward and outward, and laparotomy was therefore performed by a three-inch incision in right semilunar line. The cæcum was found much adherent and could not be brought out of the wound. The appendix was

found extending up along the outer side of cæcum, up towards the liver, was gangrenous, and ruptured during the attempts to loosen it. There was a moderate amount of sero-purulent exudation around the appendix; insufficient fibrinous membranes in the surroundings. As the cæcum was strongly adherent, the appendix was simply ligated near its insertion and cut off. It was intensely congested, gangrenous in the middle, the gangrene extending outward to the serosa, and it contained a concrement as large as a bean. The tip could not be found and was left in its place. The region was thereafter thoroughly disinfected. The pelvic cavity contained a moderate sero-purulent exudation. The abdominal cavity was therefore washed out with sterilized salt solution, an aluminum tube introduced to the bottom of Douglas's fossa, and a gauze wick drain up towards the liver on the outer side of the cæcum. The wound was then closed with five silkworm-gut sutures, the drains coming out at the lower angle.

February 21.—He rested quietly during the night. No vomiting, meteorism, or pain. Temperature, A.M. 101° F., P.M. 101° F.; pulse, A.M. 104, P.M. 96; respiration, A.M. 18, P.M. 18. Dressings changed twice. Contained a serous exudation. R Calomel one-half grain, soda two and one-half grains, every hour.

February 22.—Temperature, A.M. 100° F., P.M. 100° F.; pulse A.M. 92, P.M. 92. Several times vomiting after the administration of Epsom salts.

February 23.—Temperature, A.M. 101° F., P.M. $99\frac{1}{2}^{\circ}$ F.; pulse, A.M. 94, P.M. 90. Bowels moved freely after glycerin enema. The aluminum drain removed, as it is dry.

The patient continued thereafter to improve, although a moderate fever was present almost every evening. The wick drain was removed on February 25, and a common

rubber drain substituted, through which moderate discharge continued. On March 3 he had a slight chill, with temperature increasing to 103° F., and increasing pain up along the cæcum. The temperature kept up during the next three days, and a hard swelling developed between the crista ilii and the ribs along the outer side of the cæcum, while at the same time the discharge ceased from the drain. I was called out again on March 6. Found the patient with a temperature of 103° F., pulse 108. There was a hard infiltration between the crista ilii and the ribs, apparently pressing the cæcum inward and probably depending upon an abscess, the result of the tip of the appendix being left in the wound. Slight tenderness by deep pressure in the lumbar region. The infiltration reached half-way up to the liver, but was most pronounced above and behind anterior superior spine of the ilium. Under chloroform an incision was made from crista ilii upward in the lateral region through muscles, fascia, and peritoneum, and an abscess found on the outer side of the cæcum, containing about one ounce stinking pus. The cavity was disinfected and a drain introduced.

The result was favorable. The fever disappeared, appetite improved, and convalescence was thereafter undisturbed till March 20, when he was discharged recovered.

CASE NO. 31.

Miss Mary P., seventeen years of age. Appendicitis with gangrene, perforation, and diffuse peritonitis; laparotomy, death.

The patient, who formerly had enjoyed good health, was taken sick on the 1st of April, 1892, with violent vomiting and diarrhœa. The family physician was called in and found the patient out of bed. He ordered simple house remedies. He was called in again on April 3, and

found the patient still out of bed. Vomiting and diarrhœa had ceased, but she complained then of a fever, and pain in right ileocæcal region. The physician ordered rest, with morphine, and forbade the use of physic. The temperature on April 4 was 103° F., pulse 120, and there was tenderness over the whole abdomen, with commencing meteorism. Vomiting had reappeared, but she had had no movement of the bowels. He diagnosed appendicitis, and I was called in late in the evening for consultation. The temperature was then 103° F., pulse 140, considerable meteorism, costal respiration, intense tenderness over the whole abdomen, with rigidity of the muscles, and symptoms of collapse.

Laparotomy was performed at twelve o'clock at night, as it was evident that there was perforation present, with diffuse peritonitis. A considerable sero-purulent exudate, with diffuse peritonitis, was found. The appendix was gangrenous and perforated, without limiting adhesions. The patient died a few hours after the operation.

CASE NO. 32.

Theodore V., twelve years of age. Appendicitis with gangrene, perforation, and diffuse peritonitis; laparotomy, death.

The patient entered the Sisters of Charity Hospital on March 21, 1893, with the following history.

He had been well till seven days previously, when he complained of pains in the abdomen and general malaise. The pains were localized in the right ileocæcal region on the 15th of March. The temperature was then 100° F. Pain increased on the 16th; temperature was then $102\frac{1}{2}^{\circ}$ F. Vomiting occurred. On the 17th and 18th he had a temperature of 103° F.; a pulse of 100; beginning meteorism. The family physician ordered physic, but without any

result. On the 19th he had spontaneous evacuation, the temperature was 100° F., pulse 120, respiration 24, but the meteorism had increased considerably; the tongue was brown and dry. The patient had, at the examination at the hospital on the 21st, pronounced facies Hippocratica. The pulse was 140, respiration costal, temperature 99° F., considerable meteorism, with pronounced rigidity and tenderness in the ileocæcal region. His bowels had not moved since the 19th.

Laparotomy was immediately performed, with the usual oblique incision through the muscles. The peritoneum having been opened, about one ounce of stinking pus flowed out from the neighborhood of the appendix, which was found gangrenous and perforated, and was extirpated. The peritoneum was congested, and the bowels were agglutinated with fresh fibrinous exudations. The abdominal cavity was thoroughly irrigated and iodoform drains introduced in different directions, and the wound sutured in the upper half. R Sulphate of magnesia. The condition grew worse little by little, although motions from the bowels occurred.

March 22.—Restless night. Temperature 98° F., pulse 150, small. Meteorism unchanged. He died the same day of diffuse peritonitis.

CASE NO. 33.

Miss Adelina T., twenty-five years of age, stewardess. Appendicitis with gangrene, perforation, and beginning diffuse peritonitis; laparotomy, recovery.

On September 10, 1893, I was called on board a steamer which had just arrived from Chicago, in order to see the patient, who was stewardess on board. She was taken sick two days previously with pain in the epigastric region and in the right ileocæcal region, continual vomiting

and malaise. Considerable meteorism was found at the examination. Severe pain and rigidity of the muscles in the ileocæcal region were present, most pronounced over McBurney's point. The temperature was 103° F., pulse 120, respiration 26, costal.

I ordered the patient moved to the Sisters of Charity Hospital, and at her arrival I performed laparotomy, using the usual oblique incision through the muscles. About twelve ounces of stinking pus flowed out from the surroundings of the appendix after the peritoneum was opened, and with this two concretions as large as beans. There were extensive agglutinations of the intestines in the neighborhood. The adhesions were loosened (thorough disinfection first having been performed) and the appendix was found with some difficulty, extending upward and inward on the inner side of the cæcum. It was amputated, and was found much elongated, swollen, gangrenous, and perforated in the tip. The abdominal cavity was thereafter thoroughly washed out, though there was yet no exudation in the pelvic cavity. Drainage-tube and iodoform gauze were introduced down to the stump and up between cæcum and bowels, but no drain was introduced down to the pelvis. The wound was partly sutured. The course was favorable and she was discharged recovered on the 14th of October.

CASE NO. 34.

Mrs. P., thirty-four years of age, Youngstown, New York. Appendicitis with gangrene, perforation, and diffuse peritonitis; laparotomy, death.

The patient had for the previous six or seven years occasionally complained of pain in the right ileocæcal region, but had never been confined to her bed from that cause, and she seemed in her usual condition of health

till July 23, 1893. She had spent the forenoon with her children, in a boat, and complained suddenly at noon of a severe pain in the ileocæcal region, which gradually increased so that in the course of a few hours she was forced to go to bed. A physician ordered poultices and morphine. I was called down by telegram on the 25th, in the evening, as the condition was growing steadily worse. She had had frequent greenish vomiting; there was rigidity of the abdominal muscles; considerable meteorism, hardness and swelling in the ileocæcal region, costal respiration. Temperature was $101\frac{1}{2}^{\circ}$ F., pulse 120.

Laparotomy was performed immediately, with the usual oblique incision through the muscles over the cæcum. The appendix was found gangrenous, with a large perforation. It was surrounded by imperfect fibrinous exudations. A large fecal concrement was found free in the abdominal cavity, lying in about one ounce of stinking pus. Median incision was then performed; drainage-tube introduced down in Douglas's fossa, and the peritoneal cavity irrigated with sterilized water, by which a large amount of sero-purulent fluid was removed. She improved after the operation and had a fair night, but the symptoms grew worse next day, and she died the same evening of diffuse peritonitis.

CASE NO. 35.

Charles L., ten years of age. Appendicitis with gangrene, perforation, and diffuse peritonitis; laparotomy, death.

The patient had always formerly been well, but had for some time complained of a pain in the right ileocæcal region. He went to school, nevertheless, and the family physician was not consulted. He complained on the 27th of February, 1894, of a severe pain in the ileocæcal

region, followed by vomiting, high temperature, and quick pulse. The family physician was called in in the evening and diagnosed appendicitis. I was called in consultation the next day, February 28. The patient had had a restless and sleepless night, the pains had increased, the temperature was 103° F., pulse 130, respiration costal. There was considerable meteorism present, and the abdomen was exceedingly tender everywhere, though tenderness was most pronounced in the right ileocæcal region. There was rigidity of the muscles over the whole abdomen.

Laparotomy was performed in the afternoon, as the symptoms indicated perforation with commencing diffuse peritonitis. Incision over the cæcal region, with oblique cut through the muscles. A copious, sero-purulent exudate was found in the peritoneal cavity. The appendix was found gangrenous and perforated, and contained a large concrement. The intestines were congested, partly agglutinated with fibrinous exudates. The appendix was amputated, the peritoneal cavity irrigated, drainage-tubes were introduced, and the wound was partly sutured. The patient improved for the next twenty-four hours, but again grew worse. The meteorism increased, temperature increased to 104° F., pulse 140. Vomiting appeared again, and he died of diffuse peritonitis on March 3.

CASE NO. 36.

Lillian K., eight years of age. Appendicitis with gangrene, perforation, and diffuse peritonitis; laparotomy, death.

The patient was taken sick on the 8th of February, 1895, with the usual symptoms of appendicitis,—pain in the ileocæcal region, high fever, vomiting, and general malaise. I was called in consultation on the 10th of February. There was then considerable rigidity of the

muscles over the right side, intense tenderness by palpation, increasing meteorism, but otherwise the symptoms were more of a local than of a general peritonitis.

Laparotomy was immediately performed, and the appendix amputated. It was found gangrenous and perforated. About one ounce of sero-purulent fluid flowed out from the neighborhood of the appendix, but the peritoneal cavity was not irrigated, as the abscess was considered to be limited by adhesions. The patient did not improve after the operation; the meteorism increased and the pulse became quick and small, while at the same time symptoms of general peritonitis commenced to develop. I made, therefore, next day, median incision and washed out the peritoneal cavity with sterilized salt solution, and introduced a glass drain down in Douglas's fossa. A large amount of sero-purulent fluid with fibrinous membranes was found in the pelvic cavity and between the intestines. She died the same evening of diffuse peritonitis.

CASE NO. 37.

James R., eighteen years of age, laborer. Appendicitis with gangrene, perforation, and diffuse peritonitis; laparotomy, death.

The patient complained on April 16, 1895, after having worked the whole day, of general malaise, with pain in the right ileocæcal region. He took a half-ounce of sulphate of magnesia the next day, after which had copious evacuations. The pains, however, were not relieved, and a physician was called in on the 18th of April, who treated him with strong physic. The pains increased gradually, and meteorism appeared. A distinct swelling was felt in the right ileocæcal region on the 19th of April. The condition grew worse on the 20th; continuous vomiting occurred, with considerable meteorism and obstinate con-

stipation. I was called in consultation on April 21, in the evening. The patient was then in a miserable condition, with severe meteorism, costal respiration, pulse of 130, and rigidity of the abdominal muscles. He was immediately transported to the Sisters of Charity Hospital and laparotomy was performed the same evening, as the only remedy. Incision was made over the ileocæcal region, with the usual oblique cut through the muscles. The bowels were found congested and agglutinated with fibrinous exudations. The appendix was swollen, gangrenous, and perforated; it was found behind the cæcum and was amputated. The pelvic cavity was full of sero-purulent fluid. Median incision was therefore performed, an aluminum drainage-tube introduced, and the peritoneal cavity irrigated with sterilized salt solution. Drainage-tube and gauze tampon were introduced down to the stump through the lateral wound, which was not sutured.

April 22.—Temperature 100° F., pulse 140. Obstinate constipation, in spite of high rectal injections. The meteorism unchanged. The patient was delirious. R Hypodermic injection.

April 23.—The patient collapsed little by little, and died of diffuse peritonitis during the night.

CASE NO. 38.

Sister A., aged thirty-five years, Sister of Charity. Appendicitis, with gangrene, perforation, and commencing peritonitis; laparotomy, death from gangrene of cæcum.

The patient had formerly had a couple of attacks of appendicitis which terminated in recovery under medical treatment. She was taken sick on April 12, 1895, with general malaise and serious gastro-intestinal symptoms, continuous vomiting, and constipation. She complained

on April 13 of intense pain in the abdomen, which was increased by the lightest palpation, and of beginning meteorism. Hot applications were made, and small doses of calomel and soda given, but the symptoms continued to increase, and vomiting did not cease. Copious motion after enemata with two ounces glycerin. The condition grew worse little by little. The meteorism increased, and I was called in consultation on April 17, six days after the beginning of the attack. I found considerable meteorism, with pronounced rigidity of the muscles in the right ileocæcal region, where a large, hard swelling was felt. The temperature was 101° F., pulse 120, costal respiration. I immediately performed laparotomy and amputated the appendix. It was found considerably enlarged, gangrenous, and perforated, and was lying in an abscess containing about one ounce of stinking pus. The abscess was not limited by adhesions, and the pelvic cavity contained sero-purulent fluid. I therefore made a median incision, introduced a large glass drainage-tube into Douglas's fossa, and washed out the peritoneal cavity with sterilized salt solution. The lateral wound was plugged with iodoform gauze.

April 18.—No vomiting; temperature 100° F., pulse 96. Still considerable meteorism. R Calomel one-half grain, soda two and a half grains, every hour. As they were, however, vomited up again, they were discontinued. Large movement of the bowels after enema with turpentine and castor oil. Evening temperature was 100° F., pulse 96, respiration 22. The patient was very weak. R Ammonium valerianate one-half ounce, spiritus frumenti two ounces, liquid peptonide two ounces, water two ounces, every fourth hour by rectum, and hypodermic injections of sulphate of strychnine one-thirtieth grain every three hours.

April 19.—Temperature $101\frac{1}{2}^{\circ}$ F., pulse 100, respiration 24. The patient seemed much weaker. Still considerable meteorism.

April 20.—Twice large movements after sulphate of magnesia. The meteorism had decreased considerably, but there was still considerable tenderness in the right ileocæcal region.

April 21.—Patient comatose. Respiration superficial and very quick. Died towards the evening. The post-mortem examination showed gangrene of the lower half of the cæcum, surrounded by fresh adhesions, with two small abscesses in the neighborhood; otherwise no peritonitis present.

CASE NO. 39.

Amanda H., aged seven years. Appendicitis with gangrene, perforation, and diffuse peritonitis; laparotomy, and death.

The patient was brought to the Sisters of Charity Hospital on May 19, 1895, with the following history.

She had been healthy till six days previously, when she complained of a pain in the abdomen, constipation, lack of appetite, and light fever. She commenced to vomit three days later, and vomiting had continued since. The treatment at home was not stated. The abdomen was found at the examination much expanded, with considerable rigidity of the muscles, and was everywhere tender to the lightest touch. The respiration was costal, pulse 130, small; temperature $101\frac{1}{2}^{\circ}$ F.; tongue brown and dry. The bladder was found reaching upward almost to the navel. Catheterization having been performed, a hard, indurated swelling was felt in the right ileocæcal region.

Laparotomy was immediately performed, with usual oblique incision through the muscles. About two ounces

of stinking, sero-purulent fluid flowed out as soon as the peritoneum was opened. The peritoneum and the intestines were strongly congested here and there, with fibrinous exudations. The appendix was found gangrenous and perforated in three spots, without having limiting adhesions in the neighborhood. A small concrement was found free in the abdomen. The appendix was amputated in the usual way, and a median incision thereafter performed, through which a glass drain was introduced to the bottom of Douglas's fossa. The peritoneal cavity was irrigated with warm, sterilized salt solution until it was perfectly clear. The lateral incision was plugged down to the stump with iodoform gauze. The wound was not sutured. R Strychnine sulphate one-sixtieth of a grain every three hours. Rectal stimulation; calomel and soda.

May 20.—The condition unchanged. Twice vomiting. No evacuation; the meteorism unchanged.

May 21.—The patient was, on the demand of her parents, removed to her home, where she died the same evening of diffuse peritonitis.

CASE NO. 40.

Mrs. B., fifty years of age, Fillmore, New York. Appendicitis with gangrene, perforation, and diffuse peritonitis; laparotomy, death.

I was called on September 6, 1895, to Fillmore, about sixty miles from Buffalo, to see the patient. She had formerly enjoyed good health, and had never had an acute attack of appendicitis. She had, nevertheless, for a couple of years, now and then complained of sudden but soon disappearing pains in the right ileocæcal region. She woke up on September 4, during the night, complain-

ing of light diarrhœa and a pronounced pain in the right ileocæcal region. The temperature was in the forenoon following, when a physician was called in, $101\frac{1}{2}^{\circ}$ F., pulse 120, and the pain had increased to such a degree that it was necessary to use frequent injections of morphine. A chill occurred towards evening. Next day, September 5, she complained of general malaise, and the pain was, according to the physician's statement, most pronounced in the right ileocæcal region, but no swelling or tumor could be felt. On September 6 she vomited five times. The vomit was greenish, without fecal smell, and not very copious. Meteorism commenced and the pulse had grown somewhat quicker and weaker. The tongue was brown and dry, but pains were very little pronounced and she complained now more of a tenderness in the left iliac region than in the right. The condition at my arrival, late in the evening on September 6, was as follows: Suffering expression, tongue dry and brown, the exhaled air had a sweetish odor, the abdomen barrel-shaped, exceedingly expanded from meteorism, particularly the lower half. It was tender everywhere, but without rigidity of the muscles. There was no particularly pronounced pain over McBurney's point, and no swelling could be felt in the ileocæcal region. The most pronounced pain was over the region of the bladder. The temperature was $101\frac{1}{2}^{\circ}$ F., pulse 124, respiration 24, almost totally costal. A few dilated veins were seen over the right iliac region. Pronounced tenderness without swelling in the fornix vaginæ was discovered, but examination per rectum gave negative result. Her condition, though serious, did not seem to me so threatening nor the diagnosis so sure that immediate operation was considered indicated. The lack of rigidity and pain over McBurney's point made the diagnosis of appendicitis

doubtful. I was more inclined to believe that she had peritonitis with ileus from some internal strangulation.

R Strychnine sulphate one-thirtieth grain every three hours hypodermically, and high rectal injections of turpentine one ounce, sulphate of magnesia two ounces, tincture of assafœtida one-half ounce, water six ounces. Ice bladders over the abdomen.

September 7, early in the morning. — No vomiting during the night, but great restlessness and weakness. Some eructations, but no movement from the bowels. Temperature 101° F., pulse 126, respiration 30. The abdomen seemed somewhat softer, and upward we were able to feel peristaltic motions. The abdomen was tender on deep pressure, but she did not complain much of pain. There was no rigidity of the muscles, and no tumor could be felt at any place.

R Sulphate of magnesia one-half ounce.

The condition some hours later again was more disquieting. Greenish vomiting occurred, pulse and respiration became quicker and more superficial, and I therefore performed exploratory laparotomy over the right ileo-cæcal region. The peritoneum having been opened, about two ounces of stinking, fecal fluid, mixed with air, flowed out, sufficiently proving that there was perforation present. The appendix was found extending straight downward into the pelvis, and was six inches long. The last inch was gangrenous, and contained a large fecal concrement. Two inches from the tip, but still in the pelvic cavity, was found a small perforation surrounded by gangrenous tissue, through which fecal air and fluid flowed out. The appendix was amputated and a short median incision then made, through which a thick aluminum drainage-tube was introduced down into Douglas's fossa, the abdominal cavity washed out with sterilized

salt solution through this, while the lateral wound was kept open meanwhile. About twelve ounces of fecal, stinking fluid mixed with fresh fibrinous membranes were washed out. The wound was plugged with iodoform gauze. No sutures were introduced. The patient collapsed shortly after the operation, which did not last twenty minutes, and died on the table.

CASE NO. 41.

Edward B., seventeen years old, student. Appendicitis with gangrene, perforation, and commencing peritonitis; laparotomy, recovery.

The patient, who is an active young man, had never before complained of symptoms of appendicitis, or, for that matter, ever had pains in the abdomen or trouble with his digestion. He was hit with a ball on the abdomen on September 16, 1895, but without being otherwise injured. He spent the day as usual in school, and felt perfectly well. During the evening he complained of a sudden, severe pain in the ileocaecal region, for which poultices were applied. The temperature was later in the evening $102\frac{1}{2}^{\circ}$ F., pulse 96. A physician was called in on September 17, as the pains became more severe and radiated over the whole abdomen. He found the temperature $102\frac{1}{2}^{\circ}$ F., towards evening $103\frac{1}{2}^{\circ}$ F., pulse 120. Vomiting commenced towards the evening. He ordered morphine in sufficient doses to alleviate the pain. I was called in consultation September 18, forty hours after the beginning of the attack. The patient was then in a very apprehensive state. The temperature was $103\frac{1}{2}^{\circ}$ F., pulse 132, respiration 44, perfectly costal. Considerable meteorism was present, and the abdomen was intensely tender everywhere, but particularly so in the right ileocaecal region, where there was pronounced rigidity of the

muscles, with pain, particularly over McBurney's point. Physic had not been used. I immediately performed a laparotomy (as the symptoms indicated gangrene with perforation), using the usual oblique incision through the muscles over the cæcum. About an ounce of yellow, thick, stinking pus, which was only partly limited by adhesions, flowed out as soon as the peritoneum was opened. The appendix was found lying upward on the outer side of the cæcum. It was enormously thickened and buried in old, almost fibrinous adhesions. The outer half was partly gangrenous, and showed a perforation about one inch from the tip. The appendix contained two concretions as large as beans, in one of which a small foreign body was found. The perforation was found just between the concretions. The appendix was thereafter amputated and the whole field of operation disinfected with peroxide of hydrogen. I did not yet believe that there was general infection of the peritoneal cavity present, but a large amount of sero-purulent fluid, mixed with fibrinous exudates, flowed out upon introducing a finger into the pelvic cavity. I therefore washed out the whole peritoneal cavity with about two gallons of warm, sterilized salt solution; introduced a thick aluminum drainage-tube into Douglas's fossa through the lateral wound, and a dry, sterilized gauze tampon surrounded by protective down to the stump of the appendix. The upper part of the wound was then closed by three silkworm-gut sutures. The patient felt considerably better after the operation, but a serious chill occurred towards evening, the temperature then being $103\frac{1}{2}^{\circ}$ F., pulse 120 and superficial, costal respiration of 40. R Hypodermic injection of sulphate of strychnine one-thirtieth of a grain, and nitroglycerin one-hundredth of a grain, every three hours, and calomel one grain, soda two grains, every half-hour,

till ten powders had been used; thereafter sulphate of magnesia two ounces every hour till action.

September 19.—The patient slept four hours during the night, and the condition was somewhat improved. Temperature, A.M. 100° F., P.M. 101° F.; pulse, A.M. 100, P.M. 120. Commencing abdominal respiration. Still no movement of the bowels. R An enema with two ounces of glycerin, after which large motion. About six ounces of bloody serum were pumped out through the drainage-tube since the operation. Continued calomel and soda every hour.

September 20.—Temperature, A.M. 101° F., P.M. 100° F.; pulse, A.M. 110, P.M. 106; respiration, A.M. 26, P.M. 22. Several times fluid evacuations; the meteorism had about disappeared. The gauze tampon was removed, as he complained of pain, and about one-half ounce of pus was found behind the tampon. A rubber drain was thereafter introduced. The large aluminum drain was also removed, as the exudation had ceased, and a small rubber drain was substituted. He had taken twelve ounces of milk, three ounces of fluid beef-peptones, and champagne, and felt considerably better.

September 21.—Temperature 99° F., pulse 100, respiration 20. Meteorism had disappeared; abdominal respiration; had had two large fluid evacuations. Sep. Calomel and strychnine.

September 29.—The patient had continued to improve, but had for the previous two days had increased evening temperature. A small pus cavity was found on the outer side of the cæcum, and the wound looked gangrenous. The cavity was disinfected with peroxide of hydrogen and a thick drainage-tube introduced.

October 1.—He continued to have slight fever, and the drain was insufficient. Contra-opening, in the lateral

region, in the prolongation of the posterior axillary line. A small abscess was found on the outer side of the cæcum containing stinking pus. A drainage-tube was introduced through the former wound, out through the posterior wound.

October 3.—The operation was followed by considerable irritation; pain in the abdomen, with increasing meteorism, with high temperature (103° F.), but without vomiting. The symptoms disappeared again by the use of saline cathartics.

October 4.—He felt considerably better, but the posterior wound was slightly gangrenous. He still had light fever towards evening. R Sulphate of quinine and salol five grains of each three times a day; elixir of iron, quinine, and strychnine one teaspoonful three times a day.

October 7.—The patient was still feverish towards evening. Pulse 96, temperature 100° F.; continuous anorexia, and now and then vomiting. He complained of a pain in the epigastric region behind the upper part of the right rectus muscle. A hard, tender swelling, as large as a goose-egg, was felt here. It was covered by the rectus muscle and was lying behind the abdominal wall. Ordered poultices.

October 8.—Several times copious, greenish vomiting, after which he felt better. The swelling seemed less pronounced. Temperature 100° F., pulse 96. The vomiting had a stinking odor. R Rectal alimentation; hypodermic injections of strychnia one-thirtieth of a grain every four hours.

October 9.—Profuse greenish vomitings, with intervals of three hours. There was evidence of an obstruction present by pressure of the swelling on the duodenum or a point near the stomach. The swelling was unchanged.

No œdema or indication that it would perforate through the abdominal wall. Under narcosis, incision three inches long over the swelling. The anterior fascia of the right rectus muscle was split, the rectus muscle itself separated with blunt instruments, and the peritoneum laid free for about a square inch and plugged with iodoform gauze. The peritoneum looked perfectly healthy; the swelling could be felt just beneath it.

October 11.—No vomiting since. Temperature 99° F., pulse 120. He had taken a quart of kumys and a good deal of fluid beef-peptone. Some meteorism present. R Sulphate of magnesia.

October 12.—Temperature, A.M. 101° F., P.M. $98\frac{3}{4}^{\circ}$ F.; pulse, A.M. 120, P.M. 112. He felt much improved, and had taken a considerable amount of kumys and fluid beef-peptone and some solid food. Had a free motion after the salt. The meteorism had ceased. The gauze tampon was removed from the wound in the epigastrium. The swelling seemed less pronounced. By exploration with a hypodermic syringe no pus was found. The tampon was thereafter reapplied. The drainage-tube was removed from the wound, as both incised wounds were healthy, granulating without secretion of pus.

October 13.—Temperature, A.M. 100° F., P.M. $98\frac{3}{4}^{\circ}$ F.; pulse, A.M. 112, P.M. 96. Felt well and had a good appetite.

October 15.—Continuing to improve; pulse 92.

October 20.—Perfectly convalescent, with a good appetite; normal pulse and temperature. The wounds in the cæcal region and lumbar region were healed; the wound in the epigastric region superficially granulated. Abdominal support.

The patient has since recovered perfectly.

CASE NO. 42.

Mr. C. A. S., forty-five years of age, manufacturer. Appendicitis with total gangrene, perforation, and commencing peritonitis; laparotomy, death from suppurative pylephlebitis.

The patient stated that he had always been healthy, with the exception of more or less obstinate constipation. He felt out of sorts on October 22, 1895, but continued, nevertheless, to visit his business for two days, and thought that he had only caught a cold. He felt so ill on October 23, in the evening, that a physician was called in, who ordered light physic and morphine. During the night he complained of continuous, severe pain over the abdomen, particularly around the navel. Hot applications were used, but without allaying the pain. The pains increased on October 24, while at the same time vomiting commenced. The temperature was $100\frac{1}{2}^{\circ}$ F., pulse 92; large movement after a Seidlitz powder. The temperature on October 25, after a restless night, was $101\frac{1}{2}^{\circ}$ F., pulse 108. He complained now particularly of a pain in the right ileocæcal region. I was called in consultation and found pronounced rigidity of the muscles on the right side, where he was tender to pressure. The left half of the abdomen was less tender; the respiration was 18, abdominal. He had had a light chill in the morning.

Laparotomy was immediately performed, as the symptoms pointed towards appendicitis with perforation and commencing local abscess. The peritoneum having been opened by the usual oblique incision through the muscles, the lower end of the cæcum was found intensely congested and covered with fresh exudate and by an adherent coil of intestines. This was loosened slightly, and about three drachms of stinking pus mixed with air

flowed out. The appendix was found with some difficulty. It was totally gangrenous, seven inches long, and extended down into the pelvis; it was perforated, and was isolated with a good deal of difficulty. It was then amputated without invaginating the stump. The pelvis contained a slight, sero-purulent exudate. The pelvic cavity was, therefore, thoroughly irrigated, a thick aluminum drain introduced to the bottom of Douglas's fossa, a gauze drain surrounded with protective down to the stump, and the wound sutured in the upper half. The evening temperature was $98\frac{3}{4}^{\circ}$ F., pulse 76. R Calomel one-half grain, soda three grains, one powder every half-hour till twelve were given; thereafter sulphate of magnesia two drachms every second hour till action.

October 26.—Temperature, A.M. $98\frac{3}{8}^{\circ}$ F., P.M. 99° F.; pulse, A.M. 72, P.M. 86. He had vomited a little a couple of times; there was no meteorism present, but still no motion. About two ounces of fluid serum had been pumped out. Continue the calomel and soda.

October 27.—Four times had large, fluid evacuations; meteorism had ceased. Temperature $98\frac{3}{4}^{\circ}$ F., pulse 72. Abdominal respiration. Felt well. About one-half ounce sero-purulent fluid had been pumped out. R Calomel and soda; milk and Apollinaris. He vomited thereafter several times. The temperature increased to 100° F., pulse 120. The drains were taken out and smaller ones substituted.

October 28.—No vomiting since. Temperature $98\frac{3}{4}^{\circ}$ F., pulse, A.M. 92, P.M. 96. The vomitings recurred towards evening; they were not copious, but he vomited continually a mucous fluid mixed with a dark sediment like ground coffee. He had towards evening a serious chill. Irrigation of stomach, by which about one quart similar, almost black fluid was removed.

October 29.—Temperature $101\frac{1}{2}^{\circ}$ F., pulse 96. The tongue dry, the abdomen soft, without symptoms of peritonitis. He had one motion, which consisted of similar black stuff as he had vomited up. The patient was strongly icteric; the urine scanty and filled with gall pigment. He lay in a comatose condition, with stertorous respiration; now and then small vomitings, wherefore irrigation of stomach was repeated, bringing up a large amount of black fluid. The patient was towards evening perfectly comatose, and died at midnight. Post-mortem examination was not allowed. The symptoms indicated, in my opinion, pylephlebitis of the vena porta and septicæmia.

CASE NO. 43.

Mary R., aged twenty-five, house-maid. Appendicitis with gangrene, perforation, and diffuse peritonitis; laparotomy, death.

Four days previous to admission to hospital, patient became unwell. Two days later she assisted in a heavy washing, and that afternoon was taken with severe vomiting, chills, and pain all through the abdomen, particularly in the left inguinal region, and the menstrual flow ceased. She went to bed and took hot drinks.

December 13, 1895.—Patient unable to leave her bed, and towards evening a doctor was called, who advised her to go to the hospital. Upon arrival at hospital at about eight P.M., patient was put to bed, warm water bags were put over the abdomen, and an enema was ordered.

December 14, A.M.—Patient's expression very anxious. Her abdomen distended and everywhere painful on slightest effort at palpation. By careful manipulation a slight rigidity of abdominal muscles on right side was detected. The extreme tenderness of abdomen was a marked feature,

the greatest pain being apparently in the left inguinal region. Patient vomited about one ounce of fluid matter, of dark-green color, but not stercoraceous. Pulse 120, temperature $99\frac{1}{5}^{\circ}$ F.

Laparotomy.—Under chloroform narcosis an incision was made obliquely downward and inward, through the muscles, the upper terminal being near McBurney's point. After the abdominal muscles were cut through and peritoneum reached, the latter was found to be inflamed and the abdominal cavity contained sero-purulent exudation. When feeling for appendix a hard swelling was found, and pus appeared at the margin of the opening. The appendix was located inward between small intestines, and a concrement was found at its tip. The appendix was ligated, cut off, and found to be gangrenous and perforated; small intestines were agglutinated in the pelvis. Pelvic cavity filled with sero-purulent fluid. The intestines were loosened with the hand, and the pelvic cavity was thoroughly irrigated with salt solution. Stump was washed with sterilized water and touched with carbolic acid. A wick drain was inserted down to the stump, and an aluminum tube placed in Douglas's fossa. A dry strand was put in the latter to make the drainage more complete. The wound was partly closed with silk-worm-gut sutures, and dry compresses were applied.

New compresses were put on the wound at 3.20 P.M. and again at 7.15 P.M. At 9.20 P.M. the patient was very restless. Respiration 28, pulse 132, temperature $98\frac{4}{5}^{\circ}$ F. Prescribed strychnine sulphate one-thirtieth grain hypodermically and ordered it repeated at one P.M. Patient gradually declined, and died twenty-four hours later of diffuse peritonitis.

CASE NO. 44.

T. M. W., railroad conductor. Appendicitis with gangrene, perforation, and diffuse peritonitis; laparotomy, death.

On January 17, 1896, while at work on the train, the patient was seized with severe pains all through the lower portion of the abdomen. These pains seemed to come and go at irregular intervals all that day and the day following. Bowels had not moved since January 15. Early on the morning of January 19 he was seized with vomiting, and the pains, which were previously quite diffuse, seemed to limit themselves to the right iliac fossa. A physician was now called in, who gave morphine sulphate one-quarter of a grain hypodermically, left medicine to be given as occasion required, and ordered mustard poultices to the affected side. An enema was given some time later, but only a slight movement of the bowels resulted; bowels moved twice, however, later in the day. Flaxseed poultices ordered on January 20. I was consulted on the morning of January 21, diagnosed appendicitis, and ordered patient sent to hospital. Upon examination found patient's tongue coated with brown streaks down the centre. Pulse 120, temperature $103\frac{2}{3}^{\circ}$ F., respiration 30. Marked rigidity all over anterior abdominal wall, and extreme tenderness in right iliac fossa.

Laparotomy by a four-inch incision through muscles. Deeper layers of wall full of purulent exudation. In the peritoneal cavity a copious exudation of a sero-purulent nature. A large, gangrenous, stinking cavity was found below and outside the cæcum, but extended also upward and inward, its outer wall formed of coils of intestines. Cavity contained one and a half pints of stinking pus, and was disinfected. Appendix extended downward, was

bulb-formed, enormously congested, and contained near its insertion a large, gangrenous perforation, through which a concrement protruded, and two other gangrenous places near the tip. It was ligated and removed. Introducing after disinfection a finger down to the pelvic cavity, a large amount of stinking pus, mixed with fibrinous membranes, was removed. The abdominal cavity was thereupon thoroughly irrigated with salt solution, glass drainage-tube introduced, and wick drains into the interstices and to the stump.

Patient improved for twelve hours, but his bowels did not move, in spite of physic, meteorism increased, and he died of diffuse peritonitis twenty-six hours later.

CASE NO. 45.

Helen B., aged ten years. Appendicitis with gangrene, perforation, and acute general suppurative peritonitis; laparotomy, death.

No history of having had previous attacks. Was taken sick on May 30, 1896, with pains in the right iliac region, vomiting, slight fever, and constipation. A physician was called on May 31, who administered morphine. June 1 was given enemata and compound licorice powder, but still had no movement of bowels. Upon aggravation of above symptoms consented to go to hospital on June 4. Upon examination found the features pinched, the legs drawn up, absence of abdominal respiration; the abdomen very much distended and very painful on pressure. Pulse 120, temperature 100° F. Considerable swelling in right ileocæcal region, with strong muscular rigidity in both inguinal regions.

June 4.—Under chloroform narcosis, laparotomy was performed, an incision three inches long being made midway between anterior superior spine and outer border of

rectus, and overlying structures divided. Upon opening into peritoneum a stinking, sero-purulent fluid exuded from all parts of the peritoneal cavity. Appendix was gangrenous in its upper half; it contained an enterolith as large as a bean and was perforated at this spot; the lower half very much inflamed and gangrenous at the tip. The whole mucous membrane was gangrenous. On account of the gangrenous condition of the upper half, I was unable to invaginate; the stump was consequently ligated, the abdominal cavity well irrigated with peroxide of hydrogen and sterilized water, a metal drainage-tube inserted, and three wick drains introduced, one in the direction of the liver, another between the bowels, and one down in the pelvic cavity. Dressings changed every two hours and drainage-tube pumped every fifteen minutes. Pulse in evening 144, temperature 100° F. Child very restless. Strychnine one-eightieth grain every three hours, and whiskey every half-hour hypodermically. Child died at 11.30 P.M.

CASE NO. 46.

Jos. K., aged fifteen. Gangrenous appendicitis, with diffuse peritonitis; laparotomy, death.

Patient was taken suddenly ill on Sunday, July 19, 1896, with severe pain in right iliac region. He had been complaining for two weeks previously of more or less pain in abdomen, but did not take to bed until last Sunday.

July 20.—Patient began to vomit and has had attacks of vomiting ever since. He gives no history of having had similar attacks. A physician was called, who gave him castor oil, which caused a free movement of the bowels, and gave him morphine to keep him quiet. I was called on July 23, and found patient in a critical condition. Temperature $103\frac{1}{2}^{\circ}$ F., pulse 134, while his pulse

early in the morning was 94. I advised patient to go to hospital immediately for operation, which advice was followed, and he was brought to Sisters of Charity Hospital in emergency ambulance. Patient was in a very critical condition when he arrived at hospital. His pulse was 150, and he was in a state of collapse, and covered with cold perspiration. Examination showed abdomen slightly tympanitic, with intense tenderness over the whole ileo-cæcal region, muscles strongly retracted. Left side also showed muscular retraction in moderate degree, but much less tenderness. No particular swelling could be felt, on account of muscular rigidity. Respiration thoracic. Under narcosis—

Laparotomy.—A four-inch incision was made through muscles, about two inches inside superior anterior spine of ilium, on right side. As soon as the peritoneum was opened, about one-half pint of sero-purulent fluid came away from the whole peritoneal cavity. The cæcum was found adherent upward, but the lower end was pulled out and the appendix found four inches long, extending upward and outward, and the cæcum covered with fresh fibrinous exudations. Towards the tip was seen a large perforation, through which fecal matter exuded. The appendix was amputated near its insertion and simply ligated with silk; the mucous membrane was found in a state of almost complete gangrene; the peritoneal covering, which showed a large perforation, gangrenous in spots; it contained a concrement as large as a pea. The peritoneal cavity was thoroughly washed out with several gallons of normal salt solution, and an aluminum drainage-tube inserted down into Douglas's fossa. A drain made of gauze was inserted down to the stump, and the wound closed partially with fine silkworm-gut sutures. Pulse 130, immediately after operation. Towards evening pulse

132, temperature $101\frac{1}{2}^{\circ}$ F. Respiration 30, costal. No vomiting. Less meteorism. R Calomel one grain every hour for ten hours; thereafter magnesium sulphate ten grains every two hours, and one-thirtieth grain strychnine every three hours. About six P.M. patient began to sink. Pulse 145, respiration 40. Extremities cyanosed and cold. Gave him one-thirtieth of a grain of strychnine and fifteen minims of tincture of digitalis hypodermically, and considerable whiskey, but, notwithstanding, the patient went steadily down until he died at 8.30 P.M.

CASE NO. 47.

Martin F., age twenty-three years, saloon-keeper. Appendicitis with gangrene, perforation, and diffuse peritonitis; laparotomy, death.

Patient was admitted to Sisters' Hospital, August 16, 1896. Had been sick six days. On August 10, a physician was called, who gave patient cathartics, which did not move his bowels. Repeated, and the bowels moved on August 11. After the 11th, purgatives had no effect until the 12th, when bowels moved quite freely by aid of enema. He entered the hospital without further history, and was unable to give any himself.

On examination there was pain over McBurney's point, rigidity all over abdomen, and œdema over seat of pain. Pulse 132, respiration 38, temperature $102\frac{3}{5}^{\circ}$ F. The patient somewhat cyanosed, and covered with cold perspiration, with symptoms of collapse. Under anæsthetic he vomited a dark-brown fluid almost continuously.

Laparotomy.—Under chloroform narcosis an incision four inches long was made through muscles. Peritoneal cavity contained large quantity of stinking, sero-purulent fluid. Coils of ileum showed recent adhesions by fresh exudation. Intestines and peritoneum were intensely

congested and full of air and fluid. Appendix found extending downward into pelvis, and was removed with difficulty. Outer half totally gangrenous and perforated. Contained small enterolith; ligated with silk and cut off. Abdominal cavity thoroughly irrigated with salt solution. Three large drainage-tubes introduced towards liver, pelvis, and between the intestines. Wound packed and left open. Patient did not improve, and died three hours later.

CASE NO. 48.

Francis M., thirty years of age, physician. Appendicitis with gangrene, perforation, and beginning diffuse peritonitis; laparotomy, recovery.

Patient had an attack one year ago, while visiting Japan. It passed away in five or six days and he had been absolutely well since, being particularly free from intestinal complaints. He woke up on August 28, 1896, at 3 A.M., with colicky pains in the abdomen, which he ascribed to a heavy meal of clams and green corn the evening before. He took five grains of calomel and a Seidlitz powder, which produced six free movements. He was about home all day, grunting with severe abdominal pains, which he ascribed to the free catharsis. During the evening of the 28th the pain was quite severe around the umbilicus and radiated from there all over the belly. The tenderness was great all over by palpation and he complained of vesicular tenesmus. Had a restless night, during which he got out of bed several times, in spite of morphine hypodermically. August 29, at 10 A.M., temperature was 102° F., pulse 96. The tenderness was most severe in the iliac region. I was called in consultation at noon. Temperature 102.5° F., pulse 96, respiration partly costal. There was no muscular rigidity, but the tenderness, particularly over McBurney's point, was so

exquisite that only the slightest palpation could be made, by which an indistinct, hard swelling could be felt extending from McBurney's point downward. There was considerable tenderness in the left iliac region too. The exquisite tenderness and diffuse pains, with beginning costal respiration, made me fear gangrene with perforation and beginning diffuse peritonitis, and I therefore advised immediate operation.

Laparotomy was performed at 3 P.M., thirty-eight hours after beginning of first symptoms. A four-inch incision was made in the right semilunar line. A copious, sero-fibrinous exudation, mixed with free lymph, exuded on opening the peritoneum. The peritoneum and intestines were highly congested, here and there covered with fresh lymph. The cæcum was pulled out and found intensely congested, and also covered here and there with fresh lymph. The appendix was found extending down in the pelvis, adherent on one side. Opposite the adhesions, a small gangrenous perforation was seen near the insertion to the cæcum. The appendix was ligated and cut off at the insertion, but the ligature cut through the appendix, which at this spot was wholly gangrenous. The stump was therefore invaginated into the wall of the cæcum and covered with a piece of the omentum. The omentum was immensely thickened, here and there gangrenous, which parts were ligated and removed. The abdominal cavity was thereafter thoroughly irrigated with sterilized salt solution, an aluminum tube introduced down to Douglas's fossa, and the wound closed with five silkworm sutures. The appendix measured four and a half inches and contained two strictures, one near the cæcum and another three-fourths of an inch further out. Between these the appendix was greatly dilated and totally gangrenous, containing the perforation mentioned, but no

concrements or other contents. On the distal side of the outer stricture the appendix was strongly contracted, empty, and atrophic; the mucous membrane pale and thin, the walls thinned.

At ten P.M. temperature $99\frac{1}{2}^{\circ}$ F., pulse 84; no vomiting. The drain had been pumped out every hour and thirty grammes sero-purulent fluid removed.

August 30.—Slept a good deal without morphine. Temperature 100° F., pulse 84. Abdominal respiration more pronounced. The discharge from the drain diminishing. Capillary drain introduced into the tube. Less tenderness in left side; tongue moist; no vomiting. Evening temperature 100.2° F., pulse 90; steady improvement.

August 31.—Temperature 99° F., pulse 78. Abdominal respiration and very little tenderness in either iliac region. He passed flatus frequently. Drain was dry and was therefore removed. Evening temperature 100.2° F., pulse 72; fluid diet.

September 1.—Quiet night; temperature, A.M. $98\frac{1}{2}^{\circ}$ F., P.M. 100° F.; pulse, A.M. 72, P.M. 72; free movement of bowels after glycerin injection; common diet.

September 3.—Temperature, A.M. $98\frac{1}{2}^{\circ}$ F., P.M. 99° F.; pulse, A.M. 72, P.M. 72. Two small stitch-abscesses opened. Feels well; good appetite; free movements of bowels without physic.

September 5.—Temperature, A.M. 99° F., P.M. 100° F.; pulse, A.M. 72, P.M. 72; more stitch-abscesses.

September 6.—Temperature, A.M. 99° F., P.M. $98\frac{1}{2}^{\circ}$ F.; pulse, A.M. 72, P.M. 72.

September 9.—Continual normal temperature and pulse. Stitches removed.

September 12.—Wound healed; no inclination to rupture. Patient discharged with abdominal supporter.

CASE NO. 49.

Alphonsus L., aged eleven years. Appendicitis with gangrene and perforation, with beginning peritonitis, laparotomy, recovery.

No history of previous attacks. On Sunday afternoon, October 11, 1896, patient complained of pain in the abdomen. On Monday morning, October 12, the patient felt apparently as well as usual and went to school. On Monday afternoon he was taken again with severe pain in abdomen, especially in the right side. The pain was so severe that he could not go to school. Shortly after the attack he began to vomit; he would immediately vomit any food or drink given him. He was very constipated, and his mother gave him a cathartic early on Monday morning, which moved his bowels, but did not lessen the pain. Seeing that the patient was rapidly growing worse, his mother sent for a physician, who found him suffering with intense pain in the abdomen, most marked over McBurney's point. Rigidity, with retraction of abdominal muscles on both sides; costal respiration, nineteen per minute, temperature normal, pulse 110. The appendix could not be palpated on account of intense tenderness and rigidity of muscles.

October 13, in the morning, temperature 103° F., pulse 135. Patient had a restless night; had not vomited since. I was called in consultation at ten A.M.; found pulse 144, temperature 103° F., costal respiration 24; extreme rigidity of the right iliac region, less pronounced on left side; intense tenderness over iliac region. As the symptoms indicated gangrene with perforation and beginning peritonitis, the patient was conveyed to Sisters' Hospital and operated on at eleven A.M.

Laparotomy by incision three inches long through sheath of right rectus muscle near its margin. After opening the

peritoneum a sero-purulent exudate without fecal smell or fibrinous flakes came away,—about two ounces. The intestines were slightly congested, but not agglutinated. Cæcum was pulled out, and the appendix found covered with omentum by fresh adhesions. They were loosened and the appendix was found extending downward in the form of an S; it was very long (five inches); it contained near the outer third a small perforation, while the middle part was bulb-formed, swollen as large as a finger, and the inner part, one-half inch from cæcum, contained a firm, immovable coprolite. After ligating the mesentery the appendix was amputated near the cæcum and invaginated after Dawbarn's method. The omentum showed two gangrenous spots, which were removed. The pelvis contained about six ounces of sero-purulent fluid without smell, with some fibrinous flakes. The abdominal cavity was therefore irrigated with a large amount of sterilized salt solution in all directions; a similar sero-purulent exudation was found up behind the liver. A large glass drain was introduced into Douglas's fossa, through which a wick drain was introduced down to the bottom, and the rest of the wound closed with five silk-worm sutures. Appendix being cut open was found to contain a coprolite in the inner third as large as a bean; on the proximal side of this there was a very narrow stricture. The mucous membrane of the middle third was totally black and gangrenous, the gangrene extending all the way out to the serosa, which was gangrenous in spots. The outer third contained a second stricture, on the distal side of which the mucous membrane showed intense congestion, with loss of epithelium, but without gangrene. The perforation was found in the middle third, near the second stricture, near the attachment of the mesentery.

Six P.M.—Temperature 103° F., pulse 144, respiration 28, costal. No vomiting; no meteorism. The patient is not tender to pressure, and offers more the picture of intense infection than of peritonitis. R Infusion of digitalis one drachm, potassium acetate ten grains, spirit of nitrous ether one-half drachm, every three hours.

October 14.—Slept well, but slight discharge through capillary drain, which was changed during night. Temperature, A.M. 99° F., P.M. 100° F.; pulse, A.M. 112, P.M. 120; respiration, A.M. 24, P.M. 28. Beginning abdominal respiration; no tenderness. R Sulphate magnesia one drachm every two hours.

October 15.—Eight passages during the night. Temperature $99\frac{3}{4}^{\circ}$ F., pulse 96, respiration 22. Drain dry and tube removed; fluid diet.

October 16.—Temperature, A.M. $98\frac{3}{4}^{\circ}$ F., P.M. 100° F.; pulse, A.M. 88, P.M. 100.

October 17.—Temperature, A.M. $98\frac{3}{4}^{\circ}$ F., P.M. 99° F.; pulse, A.M. 88, P.M. 98.

October 18.—Temperature, A.M. $98\frac{3}{4}^{\circ}$ F., P.M. 99° F.; pulse, A.M. 96, P.M. 96.

October 19.—Temperature, A.M. $98\frac{3}{4}^{\circ}$ F., P.M. $99\frac{1}{2}^{\circ}$ F.; pulse, A.M. 84, P.M. 98; thereafter normal temperature. Stitches removed.

October 26.—Wound healed. Discharged recovered.

CASE NO. 50.

Miss D. W., twenty-two years of age, waitress. Appendicitis with gangrene, perforation, and beginning peritonitis; laparotomy, recovery.

Patient was operated on three years ago, she states, for double uterus. A profuse and painful menstruation has been present at each of the recurring periods. Profuse

leucorrhœa present ever since. She was attacked three weeks ago with severe pain in the region of the gall-bladder. She vomited profusely a bilious matter, with relief of pain. This has recurred several times since. She was sent to the medical ward of the Sisters' Hospital on January 14, 1897. On January 15 she had a severe rigor, the temperature rising to $103\frac{2}{3}^{\circ}$ F.

January 17.—Another chill, with temperature 103° F., followed by pain in the ileocæcal region and rapid rise of pulse until it at 11 A.M. reached 140. She was then transferred to the surgical ward for operation. Examination showed intense tenderness over whole abdomen, most pronounced over McBurney's point, and muscular rigidity in right ileocæcal region. Costal respiration, beginning meteorism. No swelling could be felt in the ileocæcal region. Under narcosis, laparotomy, by three-inch incision in right semilunar line. A profuse, sero-purulent exudation, with a stinking fecal odor, poured out as soon as the peritoneum was opened. The mesentery and intestines were intensely congested, but yet without fibrinous adhesions. The appendix was found pointing directly down towards the pelvic cavity; the mesentery was ligated, and the appendix amputated about one inch from the base, and invaginated after Dawbarn's method, the circular suture being placed about a half inch from the base of the appendix, as it was gangrenous down to the base. The appendix was found perforated in two places, the wall was very much thickened, and the mesentery enormously thickened. The mucous membrane was gangrenous, the gangrene extending out to the serous membrane, and being total in the inner inch. The whole abdomen was washed out with several gallons of sterilized salt solution, and an aluminum drain introduced down to the bottom of Douglas's fossa. A dry

capillary gauze drain was inserted into the tube. A wick drain was introduced down to the stump of the appendix and the rest of the wound closed with silkworm sutures. Pulse after operation 180, weak and soft. Eight P.M., temperature $101\frac{3}{5}^{\circ}$ F., pulse 144. Slept a little, with intervals of vomiting during the night. Ordered strychnine one-twentieth of a grain every three hours, and nitroglycerin one-hundredth of a grain.

January 18.—Temperature $101\frac{3}{5}^{\circ}$ F., pulse not countable. Respiration 38. Vomited almost continuously, save when cocaine was administered by the mouth, when the vomiting ceased for about an hour. Stomach washed out twice, with some relief.

January 19.—Temperature, A.M. $98\frac{3}{5}^{\circ}$ F., P.M. $99\frac{2}{5}^{\circ}$ F.; pulse, A.M. 104, P.M. 100. Patient rested well, vomits a great deal less than on previous day. General condition shows great improvement. Free motion of the bowels after glycerin injections.

January 20.—Condition still improves. Temperature normal, pulse 96, full and strong. Still frequent vomiting, unrelieved by any other measure than one-fourth grain of cocaine every four hours.

January 21.—Temperature, A.M. $100\frac{4}{5}^{\circ}$ F., P.M. 100° F.; pulse, A.M. 112, P.M. 96. Vomiting has ceased.

January 22.—Temperature, A.M. 99° F., P.M. 101° F.; pulse, A.M. 104, P.M. 98. The drainage-tubes were removed; patient feels quite well; retains eggnog, lemonade, beef-tea, etc.

January 23.—Temperature, A.M. 99° F., P.M. $100\frac{1}{2}^{\circ}$ F.; pulse, A.M. 96, P.M. 96.

January 24.—Lower end of the wound has opened up somewhat, and a silkworm-gut suture was applied. Temperature, A.M. $99\frac{4}{5}^{\circ}$ F., and P.M. $100\frac{1}{2}^{\circ}$ F. Patient eats and sleeps well.

January 25.—Temperature, A.M. $98\frac{1}{2}^{\circ}$ F., P.M. 100° F. Patient is gaining in weight and strength; appetite good.

February 1.—Wound healing by granulation. Temperature normal.

February 3.—Patient improving gradually, very little discharge from the wound, general condition good.

February 9.—Improving gradually.

February 22.—Wound almost healed.

March 2.—Patient out of bed with abdominal bandage.

March 10.—Discharged recovered.

CASE NO. 51.

Edw. B., nine years of age. Acute catarrhal appendicitis, with sepsis, laparotomy, recovery.

Previous history good. Never had any abdominal symptoms until March 22, 1896, when he was taken with severe pains in the abdomen, most marked in the right inguinal region, and vomiting. Mustard plaster was applied, with apparent relief to the patient. Pains returned, with temperature 102° F., pulse 120. He was then given Epsom salts and calomel, which he afterwards vomited, but felt better in the evening.

March 30.—Beginning meteorism, intense tenderness over the whole abdomen, most marked in right ileocaecal region. Temperature 98.6° F., pulse 130. Was given a glycerin suppository and a high injection. Patient sent to hospital. Examination revealed moderate meteorism, muscular rigidity on both sides, enlargement of the veins over right inguinal region, costal respiration. No vomiting during the day.

March 30, 11.30 P.M.—Laparotomy, chloroform narcosis. An incision four inches long was made through the muscles in inguinal region, right side. A copious, greenish, bile-like fluid exuded. Appendix but slightly

diseased, without adhesions, some congestion of mucous membrane. It was amputated and invaginated. Abdomen was thoroughly washed out with salt solution and a drainage-tube introduced into Douglas's fossa.

March 31.—Temperature, A.M. 99° F., P.M. $101\frac{1}{2}^{\circ}$ F.; pulse 100. Was given calomel every hour in one-sixth grain doses until ten doses had been taken, then followed by Epsom salts. He retained everything until salts were given, when he immediately vomited it. At the same time his bowels began to move, and he had frequent movements during the evening.

April 1.—Temperature, A.M. $100\frac{2}{5}^{\circ}$ F., P.M. 100° F.; pulse 100.

April 2.—Temperature, A.M. $98\frac{4}{5}^{\circ}$ F., P.M. $98\frac{1}{2}^{\circ}$ F.; pulse 84.

April 3.—Temperature $98\frac{1}{2}^{\circ}$ F., pulse 84.

April 4.—Drainage-tube removed.

April 10.—Temperature and pulse normal. Feeling and eating well; wound healing nicely.

April 16.—Stitches gave way, owing to his restlessness.

April 18.—Under chloroform the wound was scraped, edges cut and freshened, surfaces brought in apposition by secondary sutures, and an antiseptic dressing applied.

April 28.—Wound healing.

May 1.—Wound healing, except lower end.

May 3.—Patient up and around.

May 8.—Discharged recovered.

The condition of the appendix scarcely accounted for the symptoms in this case, they being those of diffuse peritonitis from perforation. It may have been one of those cases in which serious infection occurs by bacterial poisoning through septic lymphangitis.

CASE NO. 52.

John S., forty-six years of age, saloon-keeper. Acute catarrhal appendicitis, with sepsis from lymphangitis, laparotomy, death.

Patient gives a history of having had acute attacks of severe pain in the right iliac region, five, three, and two months ago respectively, which attacks were of short duration and yielded readily to morphine. Twenty-four hours before being brought to hospital, patient was taken with severe pain in right iliac region. A physician was called, who gave him hypodermic injections of morphine, also opium suppositories, ten grains of opium being given in this form in twenty-four hours, without affecting the pain. The pain rapidly grew worse, and tympanites developed, so that in a short time the abdomen was enormously distended. Patient vomited considerably and had absolute constipation, not being able to pass gas.

June 27, 1896.—I was called in consultation. Found patient in collapse, with cold extremities and imperceptible pulse.

Patient was brought to hospital in emergency ambulance and was operated upon at four P.M. Upon examination found patient "in extremis." Pulse hardly perceptible at wrist, rapid and feeble, face livid, and covered with profuse, cold perspiration; lips, fingers, nails, and hands cyanosed. Extremities cold; entire abdomen tympanitic and enormously distended. Abdomen tender to pressure, especially in right iliac region.

Laparotomy.—Under ether narcosis, an incision four inches long was made along the outer border of rectus muscle, on the right side, the centre of incision being on a line drawn from the umbilicus to anterior superior spine of ilium. All the structures were incised down to the peritoneum. The latter protruded through the incision

from the pressure within, and looked like bowel because of its dark-greenish appearance. A small incision was made through this, when a large quantity of hemorrhagic exudate spurted through the opening with great force; quantity of exudate estimated to be a quart. The incision in the peritoneum was enlarged and the hemorrhagic exudate sponged out. The appendix was sought for and found extending straight downward towards the pelvis, about five inches long. It was loosened with great difficulty from surrounding adhesions. Its mesenteric attachment was found to be greatly thickened. It was ligated one inch from cæcum and the stump invaginated after Dawbarn's method. The peritoneal cavity was then thoroughly irrigated with normal salt solution, and a drainage-tube inserted in the lower end of the incision, so that exudate that might accumulate could be drawn off with piston syringe. The wound was sutured with five silk sutures passed through all the structures; these were reinforced by a continuous catgut suture. The wound was dressed antiseptically, and patient put to bed surrounded with hot bottles, and given one-thirtieth grain of strychnine hypodermically, one-hundredth grain nitroglycerin, and whiskey.

Upon examination of the appendix, the lower one and one-half inches of mucous lining was intensely congested and inflamed, while the upper portion appeared quite normal, but was filled with fluid fæces.

Patient seemed to rally a little from the collapsed condition in which he was before the operation, but soon began to sink rapidly, and died at one A.M., June 28. He had a bloody stool just before he died.

No post-mortem examination allowed. The state of appendix scarcely accounted for the gravity of symptoms, there being no perforation or ulceration of mucous mem-

brane. It probably was one of the forms of diffuse sepsis on account of lymphangitis.

CASE NO. 53.

Mr. McG., twenty-eight years of age, student. Chronic catarrhal and recurring appendicitis, laparotomy, recovery.

The patient had in August, 1892, a serious attack of appendicitis, with vomiting, high temperature, meteorism, and intense pain in the right ileocæcal region. The attack was treated with poultices and laxatives. He had similar attacks in March, 1893, December, 1893, and February, 1894, and he, therefore, entered the Sisters of Charity Hospital on March 13, 1894. He complained of an uneasy, disagreeable feeling in the right ileocæcal region, where he was tender on pressure over McBurney's point. An enlarged, thickened, and tender appendix was felt plainly, by Edebohls's method, extending in a course downward and upward.

March 14, 1894.—Laparotomy. Incision in right linea semilunaris. The cæcum was brought out through the wound, and the appendix was found strongly adherent, bent in an obtuse angle near lower third, thickened, with infiltrated walls and congested mucous membrane. It was amputated and invaginated into the cæcum, and the wound closed by rows of sutures.

April 18.—The course was normal, without complications. He had no pain or tenderness any more. Discharged. Has been perfectly well since.

CASE NO. 54.

Anthony J., thirty-three years of age. Chronic tubercular appendicitis, laparotomy, recovery.

The patient entered the Sisters of Charity Hospital on February 28, 1894, for operation. He had been unable to

work for the previous two months, on account of pain in the ileocæcal region. His disease commenced with acute pains for two weeks, accompanied with general malaise, but the condition did not improve, and the attending physician sent him, therefore, to the hospital. At the examination a hard, painful, partly movable tumor, as large as a hen's egg, was found in the ileocæcal region, under McBurney's point. Temperature and pulse were normal.

February 29.—Laparotomy, with an oblique incision three inches long through the muscles, as the adhesions were thought to be too extensive to use incision in the right semilunar line. The appendix was found attached to the cæcum with strong adhesions. A cheesy, tuberculous focus, which was removed with a sharp spoon, was found in the adhesions between the cæcum and the appendix. The appendix was then isolated and amputated. It was enormously thickened and swollen, and the mucous membrane congested, but it did not contain concretions. The stump was invaginated in the cæcum and the serosa sutured over it with a few Lembert's sutures. The wound was closed with silkworm gut.

March 7.—Dressings changed; the wound healed.

March 20.—Discharged healthy and strong.

CASE NO. 55.

Mrs. J. S., thirty-five years of age. Chronic catarrhal appendicitis, laparotomy, recovery.

The patient had for two years complained of constipation; had otherwise been healthy, with the exception of the last two months, when she had complained of general gastro-intestinal symptoms, with pain in ileocæcal region and around the navel. She had had no pronounced attacks of appendicitis. She entered the Sisters' Hospital May 24, 1894. A hard, swollen, and painful ap-

pendix, which was slightly movable, was found by palpation after Edebohls's method.

Laparotomy.—On May 26 I made an incision in the right semilunar line. Appendix was found swollen, thickened, and the mucous membrane strongly congested. It contained some muco-pus, but no concrement. It was amputated, and invaginated into the cæcum. Abdominal wound was closed by rows of sutures. The further course was favorable and she was discharged on June 13 recovered, and has been well since.

CASE NO. 56.

Miss Anna McC., thirty-eight years of age, Fillmore, New York. Chronic, recurring appendicitis, laparotomy, recovery.

The patient, who formerly always had enjoyed good health, had been sick and confined to her bed for ten weeks. She had during those ten weeks had four distinct attacks of appendicitis, with vomiting, pain, and high fever. A new attack had supervened before she was able to leave her bed, and the intervals had become short. I was called down on May 27, 1894, as she four days previously had suffered a new relapse. At the examination of the somewhat emaciated patient I felt in the ileo-cæcal region a large, sausage-like, hard swelling, which somewhat resembled a gall-bladder. It was intensely tender upon pressure; there was some rigidity of the muscles of the right side of the abdomen, while the left side was normal. Temperature 102° F., pulse 96.

Laparotomy, with usual incision through the muscles over the cæcum. The peritoneum having been opened, the tumor was found covered with thickened and adherent omentum. The appendix was found with some difficulty; it was lying behind the cæcum, and was perfectly buried

in plastic lymph and old and new adhesions. The appendix was small and contracted. It contained a fecal concrement and a little pus. The mucous membrane was totally gangrenous. The appendix was amputated, the wound plugged with iodoform gauze down to the stump and sutured in the upper half.

The further course was favorable, and she left her bed in the course of three weeks.

I saw her again September 7, 1895. She was healthy and strong, had grown fleshy, and had had no pains. Scar was normal, without any protrusion.

CASE NO. 57.

Miss Louisa R., twenty-five years of age, teacher. Chronic catarrhal appendicitis, complicated with hæmatosalpinx and cystic degeneration of ovaries, laparotomy, recovery.

The patient had two years previously an attack of pain in the ileocæcal region, accompanied by vomiting and fever. She recovered under medical treatment, and had been well until two weeks previously, when she had a similar attack, with pain and vomiting, continuing twenty-four hours, and this time followed by a chill and fever. She continued, nevertheless, to teach for a week, when her condition forced her to go to bed. The family physician discovered then considerable tenderness over McBurney's point, and the patient continued to have moderate fever, temperature being $100\frac{1}{2}^{\circ}$ F., pulse 96. She had a poor appetite, and had for several months complained of obstinate constipation. A thickened, swollen, and tender appendix, which extended downward towards the pelvis, was felt with ease by Edebohls's method. Vaginal exploration was not performed, as the patient was a virgin. I advised operation in the Sisters of Charity Hospital,

and on June 6, 1894, laparotomy was performed, with oblique incision through the muscles, as I expected to find a small abscess. The appendix was found swollen and much enlarged, extended downward, where it was adherent to a bluish-black, non-adherent tumor as large as a fist, which showed itself to be a hæmatosalpinx. The appendix was thereafter amputated and invaginated into the cæcum. The mucous membrane was strongly congested, but without ulcerations or concretions. Median incision was thereafter performed with the patient in Trendelenburg's position, and the pelvic tumor removed. It consisted of a cystic, degenerated ovary and a large hæmatosalpinx. The left ovary was also cystic and degenerated and was removed. The abdominal cavity was irrigated and a glass drain introduced down into Douglas's fossa, and the lateral incision sutured. Temperature towards evening was 98° F., pulse 96.

June 7.—Bowels moved after usual physic.

July 10.—The further course was favorable, and the patient was discharged recovered and has been well since.

CASE NO. 58.

Miss J. McA., twenty-nine years of age, physician. Chronic catarrhal appendicitis, laparotomy, recovery.

Patient wrote the following history of her condition: In September, 1894, was attacked suddenly with pains in right iliac region, which lasted several days, with more or less severity. The attack, however, did not confine her to bed, but she suffered so much in attempting to walk that enforced quiet was necessary. For several months before this attack, constipation had been most obstinate, and immediately after it for some weeks it was almost impossible to move bowels by any means. By an attending physician the pain was attributed to retroversion of

uterus, which existed to some degree after recovery from acute attack, and for the year following the uterine treatment was kept up, with but short periods of relief from the pain, which extended from right side to rectum. Constipation continued all this time, and occasionally caused great pain. In September, 1895, a very violent attack set in, with a rise of temperature, within three hours, to 103° F., with great prostration. This continued three days, then subsided, and within a week patient was up and around, but in much distress most of the time. Went forty miles to consult a friend, and while there was again taken with sharp pains and chilliness, and the next day a quantity of pus was discharged through vagina. General health improved from that time and for several months was better than for three years. During March and April, 1896, attacks of pain became more frequent again. A hard swollen appendix was felt with ease by examination.

Laparotomy, May 20, 1896.—Under chloroform narcosis an incision was made over outer border of rectus muscle through sheath of rectus. Structures divided. Appendix found to be five inches long, pencil-like in formation; its mucous and submucous coats showed evidences of inflammation, with great thickening. It was amputated and invaginated, and wound closed by rows of sutures.

May 20.—Temperature, P.M. 99° F.

May 21.—Temperature, A.M. $99\frac{2}{5}^{\circ}$ F., P.M. 99° F.
Bowels moved thoroughly.

May 22.—Temperature, A.M. $99\frac{2}{5}^{\circ}$ F., P.M. 100° F.

May 23.—Temperature, A.M. $99\frac{2}{5}^{\circ}$ F., P.M. 99° F.

May 24.—Temperature, A.M. 99° F., P.M. 99° F.

May 25.—Temperature, A.M. $99\frac{2}{3}^{\circ}$ F., P.M. 99° F.

May 28.—Wound healed, first intention.

May 29.—Patient up and around.

May 31.—Patient discharged cured; has been well since.

CASE NO. 59.

Sister M., twenty-nine years of age, sister of charity. Chronic catarrhal appendicitis, laparotomy, recovery.

The patient had for the preceding few years had five or six attacks every year of pain and tenderness in the right ileocaecal region, every time accompanied with vomiting, fever, chills, and general malaise, which forced her to stay in bed for several weeks. She stated that a year previous, during an attack, something burst and she evacuated a large amount of pus per rectum. She entered the Sisters of Charity Hospital on September 20, 1894. An elongated, movable swelling, as thick as a finger and tender to pressure, was found over the seat of the appendix by examination according to Edebohls's method.

September 21.—Laparotomy, by aid of an incision in the right semilunar line. The lower half of the appendix was found considerably swollen and thickened, with stiff walls; the upper half of it was normal. A cicatricial stricture was found in the middle. The mucous membrane was congested, and the cavity contained an exudate looking like sago, but without concretions. The whole appendix was buried in old adhesions, and was isolated with difficulty. It was amputated and invaginated into the caecum. The wound was sutured.

September 22.—Some gastric symptoms, but no meteorism present. Normal pulse and temperature. Free motion after calomel and sulphate of magnesia.

October 2.—Sutures removed; wound healed.

October 15.—Discharged recovered.

CASE NO. 60.

Mrs. Mary C., thirty years of age. Chronic catarrhal appendicitis, laparotomy, recovery.

The patient, who had been married ten years and had one miscarriage, had complained since of dysmenorrhœa and leucorrhœa, with acute pains over the ovaries while menstruating. She also complained of dysuria and obstinate constipation. She had had ten months previously a sudden attack of severe pains in the right ileocæcal region, accompanied by vomiting and profuse menstruation. She kept her bed for two weeks, and was treated with physic on account of obstinate constipation. She had since had two similar attacks, both accompanied with pains and pronounced swelling in the ilcocæcal region. The pains had since continued. She entered the Sisters of Charity Hospital on November 1, 1894. A pronounced pain over McBurney's point was found at the examination, and a thick and swollen appendix was felt by deep palpation by Edebohls's method. The uterus was felt in its normal position by vaginal examination; no tenderness or swelling here.

November 4.—Laparotomy, by aid of an incision one and one-half inches long in the right semilunar line. The lower end of the cæcum was pulled out through the wound, and the appendix was found much elongated and exceedingly thickened. The mucous membrane was congested, but did not contain concretions or ulcerations. A slight stricture was found in the upper third. The appendix was amputated and the stump invaginated in the cæcum in the usual way, and the wound closed by rows of sutures.

November 5.—Normal pulse and temperature. Bowels had moved after calomel and soda and sulphate of magnesia.

November 16.—The wound healed. Patient discharged. She has been well since.

CASE NO. 61.

George C., twenty-nine years of age, letter carrier. Chronic catarrhal appendicitis, laparotomy, recovery.

The patient was suddenly taken sick on the 7th of March, 1895, with severe pain over the whole abdomen, but particularly around the navel. The pains continued more or less for five days, accompanied by vomiting and fever, and he was first able to do duty again after two weeks' time. He had since that time every week had attacks of diarrhœa, lasting three or four days. He had a similar attack on June 30, but it disappeared quicker. Since that time he had partly enjoyed good health, with exception of attacks of diarrhœa and light pains around the navel, until he on the 7th of October, 1895, had a third attack of violent pain in the umbilical region, accompanied with severe vomiting and continual diarrhœa. He did not call in any physician, but used simple house remedies. He consulted me a few days later. The pain had ceased, and he was feeling better again. I found at the examination, by Edebohls's method, a swollen, indurated, and tender appendix, extending downward towards the pelvis. Pressure on the appendix produced intense pain in the umbilical region. I advised the patient to enter the Sisters of Charity Hospital, and laparotomy was performed on October 12, 1895, by aid of an incision in the right semilunar line, one and one-half inches long. The appendix and the cæcum were brought out through the wound. The appendix was found lying in a curve upward behind the cæcum, and from there extending straight down in the pelvis. It was six inches long; the inner half was swollen, indurated, and thick-

ened, and contained two strictures, with one inch between which was dilated and full of mucus without concretions. The mucous membrane was here strongly congested, without ulceration. The outer half was atrophic, pale, thin, and empty. The mesentery was somewhat shortened and thickened, and covered the appendix to the tip. The appendix was amputated and invaginated into the cæcum; the wound sutured with rows of sutures. Evening temperature was 98° F., pulse 72; no vomiting.

October 13.—Normal pulse and temperature. Very well.

October 14.—Free motion after sulphate of magnesia.

October 25.—Discharged recovered.

CASE NO. 62.

Herman S., aged twenty-three years, mechanic. Chronic appendicitis, laparotomy, recovery.

The patient had for the last three years complained of intermittent pains in the abdomen and groin. They had often forced him to take to his bed for weeks at a time, and medical treatment had no influence whatever upon them. He entered the Sisters of Charity Hospital, as he was entirely unable to work. Considerable tenderness was found over the right ileocæcal region, particularly over McBurney's point, and swelling and hardness of the appendix itself were found by deep palpation after Edebohls's method. The examination produced severe pain.

March 16, 1895.—Laparotomy was performed after McBurney's method. The muscular fibres of the three abdominal muscles were separated by blunt instruments and the peritoneum opened transversely. The appendix was found considerably enlarged and thickened, and contained a fecal concrement. There was no abscess nor ulceration of the mucous membrane, but old adhesions in

the circumferences. The appendix was amputated and invaginated into the cæcum by aid of Lembert's sutures. The wound in the peritoneum was sutured, the muscles replaced, and the outer wound sutured.

March 18.—Normal temperature; felt well.

April 1.—The wound healed. Discharged. Has felt well since.

CASE NO. 63.

Mr. D. H., aged thirty-four years, inspector of police, Niagara Falls, New York. Chronic appendicitis, laparotomy, recovery.

The patient had an attack of typhoid fever two years previously. He had since that time had five or six attacks of severe pain in the right ileocæcal region, accompanied by vomiting, fever, and great prostration. He was treated every time with rest, poultices, and light physic, but entered the Sisters of Charity Hospital on August 20, 1895, as the attacks had become more and more frequent and lasted longer. A considerable tenderness over McBurney's point was found at the examination, and by deep palpation a swollen, hard, and partly immovable appendix as thick as a lead-pencil.

Laparotomy was performed on August 23, the patient previously having been kept quiet and given light physic and fluid diet. Incision one and one-half inches long at margin of the right rectus muscle. Lower end of cæcum was brought out through the wound, and the appendix amputated and invaginated into cæcum. It was found extending upward and outward on outer side of cæcum; was six inches long, and the last one and one-half inches bent in a right angle. The mesentery was much shortened, thickened, and indurated. It covered the appendix out to the tip; the appendix itself was thickened, the wall

three or four times thicker than normal; the mucous membrane swollen and congested, except at the point of bending, where it was pale and atrophic. A stricture was found at this point. The outer one and one-half inches were dilated and contained some mucus, but no concretions. The wound was united with rows of sutures.

September 3.—The wound healed by first intention, and the patient was discharged recovered.

CASE NO. 64.

Mrs. C. J., aged thirty-four years. Chronic recurring appendicitis, laparotomy, recovery.

The patient had sixteen years previously a severe attack of inflammation of the bowels. She had a similar attack eight years previously, and a third one three years previously. Her present illness commenced on September 3, 1895, with an attack of diarrhœa, after having for a long time complained of a constipation. She felt more or less ill for two or three weeks, when she suddenly had a severe chill and pain in the ileocæcal region. She kept her bed for ten days and used hot poultices, but continued nevertheless to have fever and pain. The symptoms disappeared then, little by little, and convalescence commenced. She discovered on the 17th of October, 1895, a hard but circumscribed swelling in the right ileocæcal region, and her physician advised her to enter the Sisters of Charity Hospital for operation. The temperature at the examination was 100° F., pulse 106. A hard, indurated, and partly immovable appendix, tender to pressure, was found by Edebohls's method.

October 24, 1895.—Laparotomy by incision two inches long in the right semilunar line. The appendix was found swollen, indurated, and bent backward in an acute angle, so that the tip was agglutinated in the cæcum. The

appendix was amputated and the end invaginated after Dawbarn's method. A very narrow stricture was found where it was bent, and the mucous membrane below this point was congested and the wall exceedingly thickened. Several tuberculous-looking foci, containing inspissated pus, were found in the neighborhood. The wound was sutured with rows of sutures.

October 26.—Free motion after calomel and soda and sulphate of magnesia. Pulse and temperature normal; felt well.

November 5.—Discharged recovered.

CASE NO. 65.

Mrs. Mary F., aged twenty-nine years. Chronic catarrhal appendicitis, laparotomy, recovery.

The patient had complained during the previous six years of pain in the right ileocæcal region, but never had any distinct attack of appendicitis. Her present illness had commenced on October 5, 1895, with severe colicky pains in the right iliac region. She took physic and applied poultices, but without alleviating the pain. She continued to work till October 11, 1895, and entered the Sisters of Charity Hospital on October 12. She had complained of obstinate constipation during her sickness and had not vomited. She was treated in the medical ward with calomel, soda, and morphine, but was moved on October 16 to the surgical ward, as she had not improved. Her temperature was then 101° F., pulse 108. A bulb-formed, hard swelling of the appendix, about one inch from the insertion and very tender on pressure, was found at the examination by Edebohls's method.

Laparotomy was performed by an incision in the right semilunar line one and one-half inches long. The cæcum and the appendix were brought out through the wound.

The appendix was bulb-formed, swollen, about one inch from the insertion on the distal side of the stricture. It was extirpated and invaginated after Dawbarn's method, and the wound sutured with rows of sutures. A large concrement and a little mucus were found in the bulb-formed part. The mucous membrane was congested and the submucous tissue much thickened.

October 17, 1895.—Pulse and temperature normal; no vomiting.

October 20.—Felt well.

November 3.—Discharged recovered.

CASE NO. 66.

George W. N., aged forty years, carpenter. Chronic recurring appendicitis, laparotomy, recovery.

In November, 1895, patient was taken with severe pains in right iliac region; constipation and vomiting, necessitating his confinement to bed. In three days the attack passed away, and he was not troubled again until the 9th of December, when he was seized with symptoms which were a repetition of the first attack; lasted four days and then disappeared. On February 6, 1896, was taken again with pains in the right iliac region, but he still continued to work until February 10, when, owing to an aggravation of the symptoms, he was obliged to consult a physician, who administered a hypodermic injection, and advised an operation. I was called on February 11, 1896, and advised him to go to the Sisters of Charity Hospital for operation. Upon examination I found rigidity of the abdominal muscles on the right side, but was unable to palpate appendix on account of the intense tenderness. Pulse 60, temperature 98° F.

February 12, 1896.—Laparotomy. Under chloroform narcosis an incision was made in the right semilunar line.

The appendix was found pointing downward and outward and bound down firmly by adhesions, forming a mass as large as a goose-egg, and obscuring the recognition of the appendix. Appendix was thereafter searched out, ligated, and cut off; the stump was then curetted, and an application of carbolic acid applied. The peritoneum was sewn together with chromated catgut, and fasciæ and skin with kangaroo tendons. Upon longitudinal section of appendix it was found very much thickened, the mucous membrane deeply congested, especially in the middle, with a stricture in its lower fourth. A wick drain was left at the lower end of the wound, down to the stump, which was not invaginated.

February 13.—Copious movements after one-half grain of calomel every half-hour, and salts. Temperature normal, pulse 76.

February 14.—Pulse 62, temperature 99° F. Dressings changed; the incision was found to be healing; the wick drain was removed.

February 15.—Pulse 58, temperature 99° F.

February 26.—Left hospital recovered. Patient has been well since.

CASE NO. 67.

Mary E. C., aged thirteen years. Chronic appendicitis, with ulceration of mucosa, laparotomy, recovery.

In January, 1896, patient was taken with severe pain in the right iliac region. A physician was called, who diagnosed appendicitis. Under medical treatment patient recovered rapidly, being in bed only two or three days. She was apparently well ever since, attending school every day until about two weeks ago, when she complained of severe pain in her right hip and became quite lame. She visited a physician, who told her she had hip-

joint disease, for which disease she entered the Sisters' Hospital for treatment.

Upon examination a hard, swollen appendix was felt, from McBurney's point extending in an upward direction. It was intensely tender upon pressure, producing pain in right hip, although both hip-joints were normal.

June 18, 1896.—Under chloroform narcosis an incision two inches long was made through sheath of rectus muscle. The appendix was found six inches long, lying flat upon the outside of cæcum, completely bound down by old adhesions, which were loosened with great difficulty, particularly the upper end near the liver. It was amputated one inch from the cæcum and the stump invaginated after Dawbarn's method. Wound was closed with rows of catgut sutures through the different abdominal structures cut. Appendix was stiffened and thickened; mucous membrane enormously thickened and softened, with here and there intense local congestion, at one spot amounting to necrosis of mucous membrane. Temperature $101\frac{3}{5}^{\circ}$ F. at seven P.M.

June 19.—Temperature, A.M. $99\frac{2}{5}^{\circ}$ F., P.M. 100° F.; pulse, A.M. 100, P.M. 110.

June 20.—Temperature, A.M. $100\frac{1}{5}^{\circ}$ F., P.M. $100\frac{3}{5}^{\circ}$ F.; pulse, A.M. 97, P.M. 105.

June 21.—Temperature, A.M. 100° F., P.M. $100\frac{4}{5}^{\circ}$ F.; pulse, A.M. 96, P.M. 100.

June 22.—Temperature, A.M. $99\frac{4}{5}^{\circ}$ F., P.M. $100\frac{4}{5}^{\circ}$ F.; pulse, A.M. 96, P.M. 100.

Thereafter normal pulse and temperature.

June 28.—Wound dressed and stitches were removed. Wound healed nicely by first intention.

June 30.—Patient discharged cured.

CASE NO. 68.

William W., age twelve. Chronic catarrhal appendicitis, laparotomy, death from meningitis.

The patient had been troubled at different times during the last two years with cramps and vomiting. Four days previous to admission to hospital was taken with headache, fever, cramps, vomiting, and pains in the right iliac region. A physician was called, who ordered a linseed poultice applied. This was continued until February 12, and the boy steadily improved; but the physician, diagnosing the case appendicitis and reasoning that another attack might occur at any time, advised an operation. At examination, February 13, 1896, there appeared very slight muscular rigidity. A hard, indurated, swollen appendix, tender to pressure, was felt extending downward.

Laparotomy, by one and one-half inch incision in right semilunar line. Appendix was seen as soon as peritoneum was opened, the tip bulb-formed and adherent to a piece of omentum. The mesentery was ligated and the appendix amputated a half inch from insertion, and invaginated after Dawbarn's method. Wound was closed by rows of sutures without drainage.

February 13, 1896, evening.—Temperature $99\frac{4}{5}^{\circ}$ F., pulse 114.

February 14.—Temperature, A.M. $99\frac{4}{5}^{\circ}$ F., P.M. 100° F.; pulse, A.M. 110, P.M. 112.

February 15, P.M.—Temperature 99° F., pulse 110.

February 16, A.M.—Temperature 104° F., pulse 120.

February 15, 1896, four P.M.—Patient began to vomit and to throw himself about in an hysterical way. He was given morphine one-eighth grain and strychnine one-sixtieth grain, and ice-bag was applied to head. He rested well until three A.M., February 16, then began to grow

restless. Six A.M., as he was beginning to grow weaker, was given one-sixtieth grain of strychnine. Eight A.M., began to grind his teeth, vomited a black, watery vomit; assumed the opisthotonic position of head; pupils dilated; very irritable; symptoms resembling meningitis. At 10.30 A.M., dressing removed and the wound found to be healing rapidly. No evidences of any disturbance as far as operation was concerned. No meteorism or abdominal tenderness. Was given morphine one-eighth grain and whiskey hypodermically; calomel five grains.

Twelve A.M. Patient continued to grow worse and had developed Cheyne-Stokes respiration. Given oleum tigllii two drops. He is perfectly unconscious.

Died at 5.45 P.M. Post-mortem revealed an enlarged brain which weighed sixty-four ounces. The dura was adherent to the skull-cap in two places. The membranes were somewhat congested and the right ventricle contained a straw-colored exudate.

CASE NO. 69.

W. G., North Evans, New York, twenty-eight years of age, grocer. Chronic catarrhal appendicitis, with intestinal obstruction of ileum from adhesions, laparotomy, death.

The following notes were furnished me by the attending physician. He was called to attend the patient on the 29th of January, 1896, on account of severe pharyngitis, attended with the usual symptoms. Patient continued, however, to attend to business till February 5, when he was attacked with severe abdominal pains, with tenderness most pronounced in the right iliac region, but extending from there over the whole abdomen. Pulse 90, temperature 101° F. The patient was greatly prostrated, with anxious facial expression and pinched features. On

February 6, temperature 102° F., pulse very weak and rapid; abdominal pains unchanged; foul odor *ex ore*. The abdominal pain continued from now with very acute exacerbations and slight remissions. A consultation was held on February 11 with other local physicians, and a swelling demonstrated in right iliac region, very tender to pressure and producing lancinating pains down in right femur. The patient had continued rectal tenesmus, without passing anything. Pulse varied from 55 to 100, temperature from 96½° to 101° F. He had profuse sweating during the paroxysms of pain, with cold extremities and extremely weak pulse. There was some tympanites present, but not excessive, the abdomen being uniformly expanded. The pain continued unabated, and had to be relieved by large hypodermics of morphine. On February 15 he commenced to complain of nausea, and vomited copiously. Vomiting continued and became stercoral from February 16, and he vomited from that time immense quantities of fecal matter until February 19. I was called in consultation on that day. Patient had a temperature of 100° F., pulse 108,—weak; pinched features; dry tongue; foul odor *ex ore*. The abdomen was uniformly enlarged, without muscular rigidity, and with periodical strong peristaltic movements seen and felt through the abdominal wall. He was somewhat tender to pressure in the right iliac region, where an indistinct swelling, with some slight resistance, was felt. He vomited continually a brown, fecal fluid. The diagnosis pointed directly to intestinal obstruction following an attack of appendicitis, and exploratory laparotomy was therefore proposed. After preliminary washing out of the stomach, by which several quarts of brownish fluid were removed, laparotomy was performed under ether narcosis, by incision five inches long, through the muscles

in the right iliac region. No peritonitis was found, and no exudation in the abdominal cavity. The cæcum was strongly tied down with adhesions, and the appendix, extending upward and inward, three inches long, and adherent with the tip to the cæcum, was removed with a great deal of difficulty and invaginated. It was found dilated in the outer half, the mucous membrane swollen and congested with a few superficial ulcerations extending down into the highly thickened submucous tissue. Fresh fibrinous exudations were observed on the tip where it was adherent to the cæcum. The inner half, divided from the outer half by a narrow stricture, was normal. The dilated part contained a little muco-pus. As the condition of the appendix did not account for the symptoms of obstruction, a coil of the highly dilated ileum was pulled out and followed down to the cæcum. Two inches from the cæcum, where the tip of the appendix had been found adherent, the ileum was found tied down by a band of fresh, partly organized adhesions, which completely obstructed the gut, but without yet interfering with circulation. It was doubly ligated and cut off. The wound was thereafter closed by rows of sutures, a wick drain being left in lower edge of wound, and patient put to bed. His physician stated, in a letter dated February 21, that no symptoms of peritonitis were present, but that his pulse was 124, and very weak; that fecal vomiting had ceased, and the bowels moved freely several times, but that he gradually declined and died on the third day, of shock.

CASE NO. 70.

Elizabeth W., forty-five years of age, house-wife. Nephrorrhaphy, chronic catarrhal appendicitis, laparotomy, recovery.

Patient is the mother of eleven children, one of which

was affected with sickness several years previous to the patient's examination, and the mother in caring for her child strained herself, causing a miscarriage. Since that time she had been troubled with backache and pains in the right hypochondriac and lumbar regions, varying from a sense of uneasiness to pains of most excruciating character. These pains were worse when patient assumed a sitting posture, and she had a sensation of something moving about in right lumbar region. She was unable to lie upon her left side, and had fainting spells; sometimes had frequency of micturition and at other times did not pass the normal quantity, the occasion of which was manifested by severe pains and the enlargement of a movable, internal body.

Upon examination, felt a movable tumor of renal contour, the palpation of which occasioned pain of a most sickening character.

February 18, 1896.—Nephrorrhaphy, Edebohls's method. Three chromated catgut sutures were passed through the kidney, the capsule first having been loosened and reflected; a drain of six strands of silkworm gut introduced.

February 21.—Wound dressed. The silk drain in some manner was pulled out. The incision found healing by first intention.

February 28.—A small stitch abscess discovered, which was opened and pus evacuated.

March 2.—Patient complained of pain over seat of operation, and was unable to lie upon her left side. She improved gradually during the next two weeks and had no more trouble with her bladder.

April 1.—The patient complained of a pain which seemed to start in the ileocæcal region. On examination a swollen, hard appendix was felt there, which by pressure gave pain around umbilicus.

Laparotomy.—An incision was made through sheath of rectus muscle; the muscle was pulled inward and peritoneum opened. A coil of ileum was slightly incised through serous coat, necessitating application of two sutures. Cæcum was pulled out and appendix extirpated after Dawbarn's method. The appendix was four inches long; the outer one-third atrophic and partly obliterated; the middle one-third dilated with congested and ulcerated mucous membrane. It contained two spherical concretions as large as peas. A stricture was found between middle and upper third. Wound closed by rows of sutures.

Evening temperature $99\frac{2}{3}^{\circ}$ F., pulse 72.

April 2.—Temperature $99\frac{3}{5}^{\circ}$ F., pulse 72. Same temperature in the evening. No meteorism. No pain.

April 3.—Temperature $98\frac{1}{2}^{\circ}$ F.

April 4.—Temperature, A.M. $98\frac{4}{5}^{\circ}$ F., P.M. $98\frac{2}{5}^{\circ}$ F.

April 5.—Temperature, A.M. $98\frac{4}{5}^{\circ}$ F.; bowels moved; temperature, P.M. $99\frac{3}{5}^{\circ}$ F.

April 6.—Temperature, A.M. $98\frac{4}{5}^{\circ}$ F.

She improved thereafter gradually, and left the hospital recovered on May 18, 1896.

CASE NO. 71.

John N., sailor. Chronic catarrhal appendicitis, laparotomy, recovery.

Patient's previous history up to January 1, 1896, has been good. On that date he was taken with sharp, cutting pains in the right iliac region, which radiated upward into the epigastric region. The attack was accompanied with vomiting and constipation. These pains persisted for a week, causing great suffering, then lessened in degree and changed in character from a sharp, cutting pain to a dull, aching pain, from which he had not been free up to time of treatment at hospital, and which was

aggravated upon the slightest exertion. He also complained of loss of appetite, general weakness, and gaseous eructations. Was treated in Sisters of Charity Hospital for two and a half months, and did not have an attack similar to the first, probably owing to the treatment and rest which he had.

March 17, 1896.—On examination, found hard, pencil-like swelling of appendix contour, taking origin at McBurney's point and extending downward and inward, palpation of which occasioned pain of a sickening character.

Laparotomy.—March 18. Under chloroform narcosis an incision two inches long near outer margin of rectus muscle, but through rectus sheath. Appendix was found four and a half inches long, strongly adherent, extending downward and inward. Appendix was ligated and removed one inch from its insertion, and stump invaginated after Dawbarn's method. Wound closed by catgut sutures. Lower one-third of appendix was slightly inflamed and contained considerable amount of fecal matter. The mucous membrane was thickened, but pale. The submucous tissue was five or six times thicker than normal. There was found a considerable stricture between lower and middle thirds and another between middle and upper thirds. Middle third of canal had mucous membrane intensely congested and softened, with here and there commencing ulceration, extending to the submucous tissue, which was enormously thickened.

March 18, A.M.—Pulse 64, temperature 99° F.

March 19, A.M.—Pulse 54, temperature 98° F.; P.M. pulse 76° F., temperature 99½° F.; bowels moved.

March 20, A.M.—Pulse 56, temperature 98½° F.

March 30.—Wound healed.

April 7.—Gaining strength.

April 20.—Discharged recovered. Has been well since.

CASE NO. 72.

Chas. E. K., aged thirty-six. Chronic catarrhal appendicitis, laparotomy, recovery.

Patient gave a history of having had previous attacks for the last four years, at intervals of three months. The most severe attack of all occurred in August, 1895, while taking a tour through Canada on a bicycle. He had since that time one attack in October, 1895, and another in December, 1895; still others in February and April, 1896. Attacks were characterized by lassitude, slight fever, pains in the right iliac region, constipation, and vomiting. In the course of a week the above-mentioned symptoms would pass away.

Upon examination a long, pencil-like swelling of the appendix was found, which was painful on manipulation.

Laparotomy, May 6, 1896.—Under chloroform narcosis an incision was made through the sheath of the rectus muscle. Tissues divided; appendix was found without difficulty and separated from mesentery, amputated, and invaginated. Wound sutured layer by layer; dressed antiseptically. Appendix found hardened and thickened, with inflammation of the mucous and submucous coats, with a stricture in its outer third, and one at the attachment to the cæcum. Was moderately dilated, empty, with greatly thickened submucous tissues.

May 6.—Temperature, P.M. 99° F.

May 7.—Temperature, A.M. $99\frac{1}{5}^{\circ}$ F., P.M. $99\frac{3}{5}^{\circ}$ F.

May 8.—Temperature, A.M. $99\frac{1}{5}^{\circ}$ F., P.M. $99\frac{4}{5}^{\circ}$ F.

May 9.—Temperature, A.M. 99° F., P.M. $99\frac{4}{5}^{\circ}$ F.

May 10.—Temperature, A.M. 99° F., P.M. 100° F.

May 11.—Temperature, A.M. 99° F.

May 16.—Discharged recovered.

CASE NO. 73.

Louise E., aged eleven years. Chronic catarrhal appendicitis, acute attack, laparotomy, recovery.

Three months ago patient was taken suddenly with severe pain in right ileocæcal region, with fever and vomiting, and was confined to bed for a week. After this attack she always had more or less pain in abdomen, and especially in the right iliac and lumbar regions, also over great trochanter, and at times has walked more or less lame from contraction of right psoas. Six weeks ago she jumped a rope three hundred and seventy-four times without stopping. Sunday, September 27, 1896, patient was taken suddenly with severe pain in right ileocæcal region. She went to church and Sunday-school, but felt miserable. She went to school on Monday, Tuesday, and Wednesday, but was obliged to come home from school Wednesday P.M., September 30, 1896, and go to bed. She vomited on Wednesday for the first time. She suffered intense pain on Wednesday night, October 1. She was rapidly becoming worse, and on Saturday, October 3, a physician was called, who diagnosed appendicitis, and advised that she be taken to hospital for operation. She entered the hospital at four P.M., temperature $101\frac{2}{3}^{\circ}$ F., pulse 112. Upon palpating abdomen, found great tenderness over ileocæcal region; rigidity of muscles on the right side; flexion of thigh on right side. R Tincture of opium five drops every three hours.

October 4.—Restless night, no vomiting; still considerable pain and particularly tenderness to pressure over McBurney's point. Distinct retraction of the muscles over iliac region. Temperature $100\frac{2}{3}^{\circ}$ F., pulse 96. Deep-seated, slight hardness of appendix extending straight downward.

Laparotomy by two-inch incision through rectus sheath. After opening of the peritoneum about one ounce of sero-fibrinous exudation was discharged. Cæcum was pulled out and appendix was found extending downward. The tip was adherent with fresh adhesions to peritoneum, easily loosened. Appendix was amputated, invaginated after Dawbarn's method, and the wound closed with rows of sutures. The appendix was found four inches long, the tip bulb-formed,—swollen on the distal side of a narrow stricture. The mucous membrane was congested and contained a few superficial ulcers. The submucous tissue was thickened; fresh exudates on the serosa. The appendix contained fluid fæces, the bulb-formed part a little muco-pus. At 7 P.M. temperature was $100\frac{3}{5}^{\circ}$ F., pulse 104; 8.30 P.M., gave hypodermic injection of one-eighth grain of morphine.

October 5.—Patient rested quietly during night; A.M., temperature 100° F., pulse 112; P.M., temperature $99\frac{2}{5}^{\circ}$ F., pulse 108.

October 6.—Gave patient castor oil; moved bowels freely; no pain; patient resting well; A.M., temperature $99\frac{2}{5}^{\circ}$ F., pulse 100; P.M., temperature 100° F., pulse 104.

October 7.—Slept well; no pain; light diet; A.M., temperature 99° F., pulse 100; P.M., temperature $99\frac{2}{5}^{\circ}$ F., pulse 104.

October 9.—Patient resting well; no pain; A.M., temperature 99° F., pulse 100; P.M., temperature $99\frac{2}{5}^{\circ}$ F., pulse 104.

October 10.—Removed dressing. Found wound healed by first intention. Normal temperature and pulse.

October 16.—Discharged recovered. No inclination to rupture.

CASE NO. 74.

Johanna B., servant-girl, aged seventeen years. Chronic catarrhal apendicitis, laparotomy, recovery.

No family history of tuberculosis. When five years of age patient had scarlet fever, and ever since has not enjoyed as good health as before. She has always suffered from constipation, requiring cathartics to move bowels. Has suffered from repeated attacks of severe pain in right iliac region, never being confined to bed during any of them longer than two weeks. Has never vomited during any of these attacks. Patient began to menstruate at sixteen and has always been quite regular up to four months ago, when she began to menstruate two or three times a month, lasting from two to seven days each time. Last month she menstruated three times. Does not suffer much pain at her menstrual periods. Five weeks ago patient was taken suddenly ill with severe pain in abdomen. Two days later pain became localized in right iliac region and patient began to vomit. She could not retain any food. For several days vomited all food and drink taken. Bowels constipated; have not moved in a week. Examination on entrance to Sisters' Hospital on November 19, 1896, shows patient emaciated and skin sallow. On palpation of abdomen find slight rigidity of muscles on right side. Deep pressure over McBurney's point reveals a small mass about four inches long, about as large as a lead-pencil, extending downward towards pelvis. This can be rolled under fingers and is very painful. Temperature 99° F., pulse 80.

Laparotomy, November 21.—Under chloroform, made an incision two inches long through sheath of rectus. Cæcum was pulled out through the wound. Appendix was found adherent by fresh adhesions and was extirpated and in-

vaginated after Dawbarn's method. Wound closed by rows of sutures. Appendix was about four inches long. The outer one-third, on the distal side of a stricture, was normal; the inner two-thirds were dilated with thickened walls; mucous membrane was intensely congested, but without ulceration; no concretions. Evening temperature, $98\frac{2}{5}^{\circ}$ F., pulse 76.

November 22.—Slept well during the night. Vomited slightly a few times. Temperature, A.M. 99° F., P.M. $99\frac{1}{2}^{\circ}$ F.; pulse, A.M. 76, P.M. 84. No meteorism; no abdominal tenderness. R Calomel one grain, soda two and one-half grains, every hour for eight hours.

November 23.—Patient slept well. Temperature, A.M. 99° F., P.M. $99\frac{1}{2}^{\circ}$ F. Eight tablets did not move bowels.

November 24.—Patient slept well. Temperature $98\frac{4}{5}^{\circ}$ F., pulse 71. Castor oil; bowels moved freely.

December 1.—Patient making uninterrupted recovery.

December 3.—Patient discharged recovered.

CASE NO. 75.

Henry G., aged fourteen years, school-boy. Intestinal obstruction from chronic appendicitis, laparotomy, recovery.

Patient entered Sisters' Hospital on December 1, 1896. He has had none of the ills incident to childhood. Until September, 1896, he had never been sick. On that date he was suddenly seized with severe pain all over abdomen, which was supposed to be colic. As the pain did not lessen the next day, a physician was called, who treated him for "inflammation of the bowels." During the attack, which lasted eight weeks, patient vomited from four to eight times daily. A localized tenderness was noticed the third day over McBurney's point, which lasted eight

days. Bowels moved freely during the acute attack. Temperature, pulse, and respiration were not obtainable. For four weeks, beginning November 1, he was perfectly well. On Friday, November 27, he was awakened with a severe pain over region of stomach, similar to first colicky attack of three months ago. In a few moments the bowels moved freely, and since that time there has been absolute constipation, not even gas being passed. He began to vomit early on Friday, November 27, and since then has vomited about six times in twenty-four hours. Vomited matter consisted of curdled milk mixed with a dark-brown liquid resembling fecal matter, but without odor. Cathartics and enemata failed to move the bowels. Examination shows abdomen distended, intestines filled with gas, and no point where touch or pressure is particularly painful. At 3.30 P.M., temperature 99° F., pulse 96, respiration 20.

December 2.—Under chloroform narcosis, exploratory laparotomy by an incision four inches long, just external to right rectus muscle. The appendix was found bound down by old adhesions. These were tied off and the appendix cut off about three-quarters of an inch from base, and the stump invaginated by Dawbarn's method. The lower end of the appendix was torn off during manipulation and could not be found in the dense adhesions. The sigmoid flexure was found strongly adherent in the right ileocecal region, with hard, dense adhesions, which were loosened with difficulty. Above these the colon was greatly dilated; below the rectum was empty and contracted. Operation took about two hours. The abdominal cavity was irrigated with salt solution and an aluminum drain introduced to the bottom, containing a strip of sterilized gauze for capillary drainage. The rest of the wound was closed by rows of sutures. The removed portion of the appendix was thickened, with hard,

infiltrated walls. It contained a stricture, on the distal side of which the mucous membrane was congested, swollen, and softened, but without ulceration; the tip was not found. About four P.M. bowels moved slightly. At five had a free passage,—a liquid, clay-colored stool. Between five and ten P.M. had three more passages, and at 10.30 an enormous discharge of gas, with immediate subsidence of the distention. Dressings removed and fresh ones applied at 9.30. Discharge very slight.

December 2.—Temperature 99° F., pulse 120.

December 3.—Temperature, A.M. $99\frac{2}{5}^{\circ}$ F., P.M. $100\frac{3}{5}^{\circ}$ F.; pulse, A.M. 120, P.M. 100.

December 4.—Temperature, A.M. 100° F., P.M. $100\frac{2}{5}^{\circ}$ F.; pulse, A.M. 100, P.M. 106.

December 5.—Temperature, A.M. 100° F., P.M. 100° F.; pulse, A.M. 96, P.M. 96.

December 6.—Temperature, A.M. 100° F., P.M. 100° F.; pulse, A.M. 94, P.M. 92.

December 7.—Temperature, A.M. 98.6° F., P.M. 100° F.; pulse, A.M. 82, P.M. 96.

December 4.—Drain removed; no pain; sleeps and eats well.

December 8.—Patient doing well; temperature 100° F. Constipated; enema given; bowels moved freely.

December 8–12.—Temperature morning and evening 100° F. Patient complains of internal hemorrhoids. R Compound liquorice powder one drachm every evening, glyceride of tannin locally.

December 12, 13, 14.—Temperature 99° – $99\frac{2}{5}^{\circ}$ F.

December 14.—Stitches removed; wound dressed; piles have disappeared.

December 20.—Wound completely healed. Patient feeling well; sitting up.

December 24.—Discharged cured.

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INDEX.

A.

Abscess, circumscribed, 68.
 position of the, 60.
 retrocæcal, operation in, 166.
 retroperitoneal, primary, 65.
Actinomycosis as exciting cause, 48.
Acute irritant poisoning, diagnosis from, 106.
Age as predisposing cause, 35.
Anatomical position and structure as predisposing cause, 29.
Anatomy of appendix, 17.
Appendicitis, actinomycosis as exciting cause of, 48.
 age as predisposing cause of, 35.
 anatomical position and structure as predisposing causes of, 29.
 causes of, 28.
 chronic recurring, 73.
 symptoms of, 87.
 classification of, 51.
 complicating pregnancy, 93.
 constitutional disturbances as predisposing causes of, 33.
 coprolites and foreign bodies as exciting causes of, 37.
 exciting causes of, 37.
 form present, diagnosis of, 96.
 frequency of, 49.
 gangrenous, 70.
 indigestion and constipation as predisposing causes of, 30.
 infectious, 62.

Appendicitis, microbes as exciting cause of, 40.
 nationality as predisposing cause of, 37.
 obliterans, 58.
 pathology of acute septic, without exudation, 72.
 chronic, recurring, 73.
 gangrenous, 70.
 infectious, 62.
 perforative, 70.
 simple catarrhal, 55.
 subacute, with dry fibrinous adhesions, 72.
 ulcerative, 59.
 with diffuse peritonitis, 72.
 with progressive fibropurulent peritonitis, 72.
perforative, 70.
predisposing causes of, 29.
previous attacks as predisposing causes of, 31.
question at present, the, in
 Denmark, 135.
 in England, 123.
 in France, 130.
 in Germany, 127.
 in Sweden, 134.
 in United States, 137.
rheumatism as predisposing cause of, 34.
sex as predisposing cause of, 36.
simple catarrhal, 55.
special forms of, 72.

- Appendicitis, strictures, kinks, and mechanical obstruction as exciting causes of, 46.
 subacute, 88.
 chronic, 88.
 recurring, 88.
 relapsing, 88.
 time of second attack in, 74.
 traumatism and over-eating as exciting causes of, 48.
 tuberculosis as predisposing cause of, 33.
 typhoid fever, eruptive fevers, and dysentery as predisposing causes of, 34.
 ulcerative, 59.
 will a case of, perforate 97.
- Appendix, anatomy of, 17.
 diameter of, 19.
 found in ruptures, 61.
 function of, 24.
 insertion of, 20.
 length of, 18.
 new growths of, 75.
 obliteration of, 57.
 position of, 19.
 removal of, in all cases, 141.
 in chronic recurring cases, 144.
- Attacks, previous, as predisposing cause, 31.
 time of second, 74.

B.

- Bacillus coli communis, 40.
 Bladder, irritable, as a symptom, 85.

C.

- Cæcum, catarrhal inflammation of, as the cause of appendicitis, 30.
 frequency of origin in, 25.

- Cancer of the cæcum, diagnosis from, 107.
 Catarrhal appendicitis, 55.
 inflammation of the cæcum as the cause of appendicitis, 30.
 Cathartics, treatment with, 150.
 Causes of obstruction, 67.
 of the tumor, 81.
 Chill, 85.
 Chronic lymphadenitis, 64.
 recurring appendicitis, 73.
 symptoms of, 87.
 cases, removal of appendix in, 144.
 or early acute cases, operation in, 163.
 Circumscribed abscess, 68.
 Classification of appendicitis, 51.
 Colic, renal, diagnosis from, 105.
 Complications and sequels, fatal
 hemorrhage, 91.
 fecal fistula, 92.
 intestinal obstruction, 89.
 parotitis, 91.
 peritonitis, 89.
 phlebitis and thrombosis, 91.
 phlegmonous inflammations, 93.
 pregnancy, 93.
 pylephlebitis and hepatic abscess, 90.
 Conclusions, general, 170.
 in regard to methods of operation, 170.
 Constipation as a symptom, 80.
 Constitutional disturbances as predisposing causes, 33.
 Contraction of the ileo-psoas muscle, 86.
 Coprolites, 37.
 Costal respiration as a symptom, 85.

Coxitis, diagnosis from, 106.
 Cure, spontaneous, 120.
 Cystic dilatation, 59.

D.

Diagnosis, 93.
 differential, 100.
 from acute irritant poisoning, 106.
 from cancer of the cæcum, 107.
 from coxitis, 106.
 from diseases of gall-bladder, 104.
 from extra-uterine pregnancy, 105.
 from gastric and duodenal ulcers, 103.
 from intestinal obstruction, 103.
 from movable kidney, 105.
 from psoas and lumbar abscesses, 107.
 from pyosalpinx, 106.
 from renal colic, 105.
 from tuberculous peritonitis, 107.
 from typhlitis stercoralis, 100.
 from typhoid fever, 103.
 from ureteritis, 107.
 of form of appendicitis present, 96.
 of perforation, 98.
 of presence of pus, 100.
 Diameter of appendix, 19.
 Diffuse peritonitis, mortality in, 168.
 operation in, 166.
 septic peritonitis, 69.
 Dilatation, cystic, 59.
 Dysentery as predisposing cause, 34.

E.

Edebohls's method of palpation, 94.
 Etiology, 25.
 Exciting causes of actinomycosis, 48.
 of coprolites and foreign bodies, 37.
 of microbes, 46.
 of strictures, kinks, and mechanical obstruction, 46.
 of traumatism and over-eating, 48.
 Extraperitoneal operation, 155.
 -uterine pregnancy, diagnosis from, 105.
 Exudation, serofibrinous, 70.

F.

Fatal hemorrhage as a sequel, 91.
 Fecal fistula, 92.
 Fibrinoplastic or adhesive peritonitis, 66.
 -purulent peritonitis, 68.
 Fistula, fecal, 92.
 Foreign bodies, 37.
 Frequency of appendicitis, 49.
 of origin in cæcum, 25.
 of perforation, 71.
 relative, of mild and severe cases, 108.
 Function of appendix, 24.

G.

Gall-bladder, diagnosis from diseases of, 104.
 Gangrenous appendicitis, 70.
 General symptoms, 87.

H.

- Hemorrhage, fatal, as a sequel, 91.
- Hepatic abscess as a complication, 90.
- Histology, 22.
- Historical introduction, 7.

I.

- Ileo-psoas muscle, contraction of, 86.
- Indican in urine, 86.
- Indigestion and constipation as predisposing causes, 30.
- Infectious appendicitis, 62.
- Insertion of appendix, 20.
- Intestinal obstruction as a complication, 89.
 - diagnosis from, 103.
- Introduction, historical, 7.
- Irritable bladder as a symptom, 85.

K.

- Kidney, movable, diagnosis from, 105.

L.

- Length of appendix, 18.
- Leucocytosis, its value as a symptom, 86.
- Life insurance, risk to, 74.
- Lymphadenitis, chronic, 64.
- Lymphangitis, septic, 63.

M.

- McBurney's operation, 164.
 - point, 79.
- Medical treatment, 145.
 - mortality under, 108, 118.
- Mesenterium, 21.
- Microbes as exciting cause, 40.
- Mild and severe cases, relative frequency of, 108.

Morris's operation, 164.

- Mortality if every case was operated on early, 116.
 - in cases of diffuse peritonitis, 168.
 - in early operations, 116.
 - under antiphlogistic treatment, 130.
 - under medical treatment, 108, 118.
 - under opium treatment, 148.
 - under surgical treatment, 114, 118.

Movable kidney, diagnosis from, 105.

Muscles, abdominal, rigidity of, 81.

N.

- Nationality as predisposing cause, 37.
- New growths of appendix, 75.

O.

- Obliteration of appendix, 57.
- Obstruction, causes of, 67.
 - intestinal, as a complication, 89.
 - diagnosis from, 103.
- Operation, extraperitoneal, 155.
 - in chronic recurring or in early acute cases, 163.
 - in diffuse peritonitis, 166.
 - in perforative cases with local abscess, 154.
 - in retrocaecal abscesses, 166.
 - McBurney's, 164.
 - Morris's, 164.
 - Sonnenburg's, 161.
- Operations, early, mortality in, 116.
- Opium, treatment with, 146.

Opium-treatment, mortality under, 148.

Origin in the cæcum, frequency of, 25.

P.

Pain as a symptom, 77.

Palpation, Edebohls's method of, 94.

Parotitis as a complication, 91.

Pathology, 49.

Percussion, its value as a symptom, 84.

Perforation, diagnosis of, 98.

due to typhlitis stercoralis, 27.

frequency of, 71.

has it occurred? 98.

impending, symptoms of, 98.

Perforative appendicitis, 70.

cases with local abscess, operation in, 154.

Peritoneal lesions, 66.

Peritonitis, diffuse septic, 69.

mortality in, 168.

operation in, 166.

fibrinoplastic or adhesive, 66.

fibrinopurulent, 68.

septic, time of death in, 112.

seropurulent or serosanguinolent, 69.

tuberculous, diagnosis from, 107.

Phlebitis and thrombosis as a complication, 91.

Pneumococcus, 45.

Poisoning, acute irritant, diagnosis from, 106.

Position of abscess, 60.

of appendix, 19.

Predisposing causes, 29.

age, 35.

anatomical position and structure, 29.

Predisposing causes, indigestion and constipation, 30.

nationality, 37.

previous attacks, 31.

sex, 36.

tuberculosis, 33.

typhoid fever, eruptive fevers, and dysentery, 34.

Pregnancy complicated by appendicitis, 93.

Previous attacks as predisposing causes, 31.

Prognosis, 108.

under surgical treatment depending upon time of operation, 111.

Psoas and lumbar abscesses, diagnosis from, 107.

Pulse and temperature, 84.

Pus, diagnosis of presence of, 100.

Pylephlebitis as a complication, 90.

Pyosalpinx, diagnosis from, 106.

R.

Recovery, complete, after a genuine attack, 118.

Recurrence, when appendix is not removed, 144.

Relapses, percentages of, 32, 74.

Removal of appendix in all cases, 141.

in chronic recurring cases, 144.

Renal colic, diagnosis from, 105.

Respiration, costal, as a symptom, 85.

Retrocæcal abscesses, operation in, 166.

Rheumatism as predisposing cause, 34.

Rigidity of abdominal muscles as a symptom, 87.
 Risk to life insurance, 74.
 Ruptures, appendix in, 61.

S.

Septic lymphangitis, 63.
 peritonitis, diffuse, 69.
 Serofibrinous exudation, 70.
 Seropurulent or serosanguinolent peritonitis, 69.
 Sex as predisposing cause, 36.
 Sonnenburg's operation, 161.
 Spontaneous cure, 120.
 Staphylococcus aureus and albus, 44.
 Statistics, 171.
 Streptococcus pyogenes, 44.
 Strictures, kinks, and mechanical obstruction as exciting causes, 46.
 Stump, treatment of, 159.
 Surgical treatment, 153.
 mortality under, 114, 118.
 Symptomatology, 75.
 Symptoms—
 Chill, 85.
 Constipation, 80.
 Contraction of ileo-psoas muscle, 86.
 Costal respiration, 85.
 Dilatation of veins, 87.
 Irritable bladder, 85.
 Leucocytosis, 86.
 Pain, 77.
 Percussion, 84.
 Rigidity, 81.
 Temperature and pulse, 84.
 Tenderness to pressure, 79.
 Tumor, 81.
 Tympanitis, 83.
 Urine, 86.
 Vomiting, 80.

Symptoms of chronic recurring
 appendicitis, 87.
 of diffuse peritonitis, 76.
 of general, 87.
 of impending perforation, 98.
 of local circumscribed abscess, 76.
 of pylephlebitis and pylethrombosis, 90.
 of simple catarrhal appendicitis, 76.

T.

Temperature and pulse, 84.
 Tenderness to pressure as a symptom, 79.
 Thrombosis as a complication, 91.
 Time of death in septic peritonitis, 112.
 second attack in appendicitis, 74.
 Tongue, condition of, 85.
 Traumatism and over-eating as exciting causes, 48.
 Treatment, 122.
 antiphlogistic, mortality under, 130.
 conservative, compared with operative, 110.
 medical, 145.
 of acute cases between third and sixth days, 141.
 of stump, 159.
 operative, compared with conservative, 110.
 surgical, 153.
 with cathartics, 150.
 with opium, 146.
 Tuberculosis as predisposing cause, 33.

Tuberculous peritonitis, diagnosis
from, 107.

Tumor and its causes, 87.

Tympanitis as a symptom, 83.

Typhlitis stercoralis as cause of per-
foration, 27.

diagnosis from, 100.

Typhoid fever as predisposing
cause, 34.

diagnosis from, 103.

U.

Ulcerative appendicitis, 59.

Ureteritis, diagnosis from, 107.

Urine, contents in, 86.

V.

Veins, dilatation of, as a symptom,
87.

Vomiting as a symptom, 80.

THE END.

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