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Appendicitis and Perityphlitis.

By Charles Talamon, M. D.

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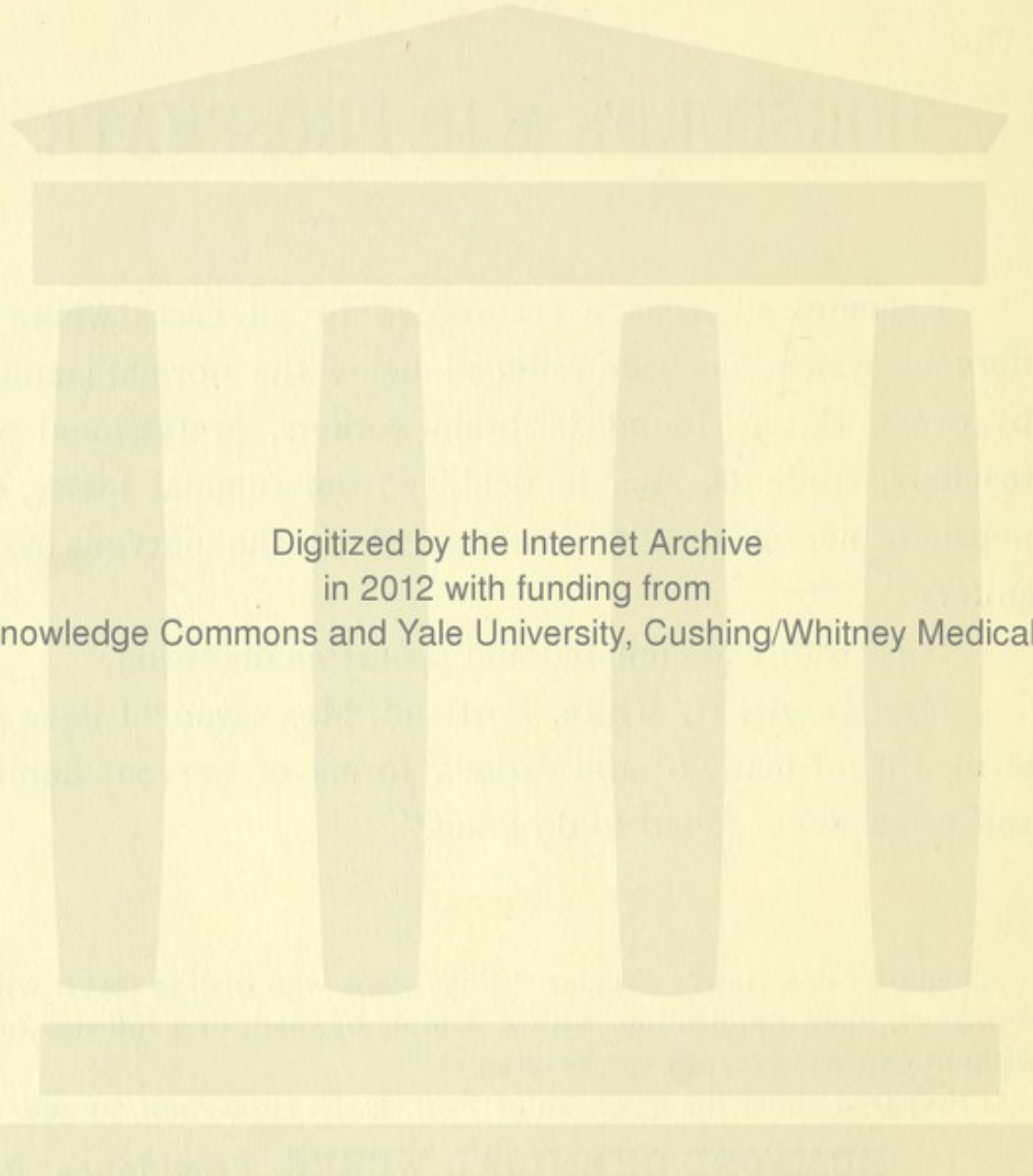
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APPENDICITIS
— AND —
PERITYPHLITIS

BY
CHARLES TALAMON, M. D.,
*Physician to Tenon Hospital,
Paris, France.*

TRANSLATED BY E. P. HURD, M. D.



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DETROIT, MICH.

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TRANSLATOR'S PREFACE.

Dr. Charles Talamon is one of the younger men in the medical profession in France who is fast earning a wide reputation as a writer.

His first work, "Études Médicales," was published in 1881. It was written in conjunction with Prof. Lecorché, and has been a favorite with students of medicine, discussing in a masterly manner the deepest problems of medical science.

In the volume of Prof. Germain Sée, published in 1885, and entitled "Diseases of the Lungs of a Specific, not Tuberculous Nature," the larger part, and particularly the long and strikingly original chapter on Pneumonia, is the work of Talamon, and in the book by Sée on "Simple Diseases of the Lungs," published the following year, a considerable portion was also written by him.

Talamon, in conjunction with Prof. Lecorché, is also the author of a work on Bright's Disease, published in 1888, which is now a standard text-book on that subject. It is a very critical and exhaustive treatise, and merits a place in the library of all who are interested in renal diseases. In this work the unity of Bright's disease, in opposition to the dualism of Frerichs, Virchow and others, is ably defended.

Talamon has done much good work in bacteriology, and made some valuable discoveries; his name will always be associated with the peculiar lanceolated coccus of acute pneumonia, now known as the Talamon-Fränkell microbe.

The work here given to the American public is the first of a series originated by Charcot and Debove, and published by Rueff & Co., of Paris. Although there has been much written on Appendicitis the past few years, it can hardly be said that any connected treatise on the subject had appeared till the

publication of this work. The very name *appendicitis* was unknown ten years ago.

In the light of recent pathology, typhlitis and perityphlitis independent of appendicitis must henceforth be relegated to the land of myths and fables. Stercoral typhlitis is destined to disappear from nosology, and idiopathic peritonitis is a bugaboo which no one ever saw or ever will see. When appendicitis and its consequences are once understood, many mysteries connected with peritoneal inflammations, deep abdominal abscesses, and other points of abdominal pathology, will have become clear.

The present treatise is a good *résumé* of what we have learned of appendicitis and perityphlitis since the disease was first defined and described by our own countryman, Dr. Reginald Fitz. No more practical and useful treatise could be offered the general practitioner, who is certain to see many cases of appendicitis every year, and who knows by sad experience the fatality of this disease.

E. P. HURD, M. D.

NEWBURYPORT, MASS., Jan. 23, 1893.

I.

HISTORICAL AND CRITICAL RESUME.

Physicians have long been agreed in admitting the clinical existence of an assemblage of morbid phenomena with the following characteristics: A fixed pain in the right iliac fossa, preceded or accompanied by abdominal colic, and followed by the formation of a painful tumor which ends more or less rapidly in resolution or in suppuration. But for the past sixty years, pathologists have disputed about the seat of the lesions—whether intra or extra cæcal to which this syndrome belongs, nor has there been unanimity as to the name which should be applied to it. Some have called it a primary inflammation of the cæcum, others, of the retro-peritoneal cellular tissue. According to some, the cæcal inflammation may propagate itself to the cellular tissue; according to others, it may determine by perforation of the intestinal walls, either a suppurative phlegmon or a peritonitis. The latter confound under the name of typhlitis all the inflammatory accidents of the region, whatever the seat; those who hold to the other view reserve this name for the inflammation when limited to the cæcum. But Ziegler applies the name typhlitis to inflammation of the appendix, and perityphlitis to the inflammation of the adjacent parts. According to Burne, typhlo-enteritis is at the same

time inflammation and perforation of the cæcum and appendix. Golbeck, who appears to have been the first to employ the word perityphlitis, reports under this name a case of peritonitis by perforation of the appendix. But Oppolzer would reserve this term for a limited inflammation of the peritoneal coat of the cæcum and appendix, and proposes the name of *paratyphlitis* for the inflammation of the retro-cæcal cellular tissue.

The researches of the last ten years seem to have definitively established that the seat of the evil is not primarily in the cæcum or in the surrounding cellular tissue, but in the appendix vermiformis. The word typhlitis, which means inflammation of the cæcum, is then doomed to disappear and give place to the name *appendicitis*.

1. THE TYPHLITIS OF ALBERS, OF BONN.

Albers, of Bonn, is responsible for the description of typhlitis which has for nearly sixty years been current in all our text books and treatises on pathology. He was the first to conceive the notion of making of a limited inflammation of the cæcum an affection distinct from the other varieties of entero-colitis, and to ascribe to it the aggregate of painful and inflammatory phenomena already by other writers noticed in the region of the right iliac fossa; and he proposed for this affection the name of typhlitis.

Albers recognizes four varieties of typhlitis:

1. Stercoral typhlitis due to stagnation of fæcal matters in the cæcum, and to the irritation caused by these matters.
2. Simple typhlitis, in relation with the divers agents of irritation which may provoke inflammation of the intestinal mucosa, the effects of this irritation localizing themselves in the mucous membrane of the cæcum.

3. Perityphlitis, caused by the propagation of the inflammation of the internal membrane to the external coat of the cæcum and the surrounding parts.

4. Chronic typhlitis, whose accidents present themselves under the aspect of an affection with slow and prolonged course.¹

Although this conception of Albers ultimately became current, and has continued to be so till the last few years, it met with determined opponents, one of whom was Grisolle. Even in the last edition of his treatise on Internal Pathology, this writer did not once use the name of typhlitis. Albers' disease was non-existent for him. He knew only the perforations of the ileo-cæcal appendix and the phlegmons of the iliac fossa. He did not understand how simple inflammation of the mucous membrane of the cæcum could have the grave consequences attributed to it, when ulcerous inflammation of the same mucosa, even when it causes deep and multiple losses of substance as in typhoid fever or dysentery, shows no tendency to invade the surrounding cellular tissue.

The stercoral typhlitis of Albers, none the less gradually won acceptance. It became the custom to refer inflammations of the iliac fossa to fæcal engorgement of the cæcum, and its consequences. All the treatises on the practice of medicine, one after another recognized under the name of typhlitis, an inflammation localized in the first part of the large intestine, which might terminate by resolution or by perforation, the perforation of the posterior part giving rise to a perityphlitis with abscess of the neighboring cellular tissue, perforation of the anterior part causing peritonitis.

In point of fact, the notion of Albers is purely theoretical. It lacks the only serious and certain criterium which the pathologist can demand, the proof furnished by pathological anatomy. No one has ever seen on the cadaver either simple typhlitis or stercoral typhlitis. When, in cases where such a diagnosis has been made, the patients succumb, one invariably finds at the autopsy, either a perforation of the appendix, or a pericæcal abscess, or a peritonitis, but never a simple and isolated inflammation of the cæcum. The writers who have defended this view have only succeeded in justifying it by

¹ Albers, Beobachtungen auf dem Gebiete der Path. und Path. Anat. Bonn 1838 and Journal l' Experience 1839, p. 129.

systematically confounding the specific inflammations of the cæcum, tuberculous, typhoid, and such like, the perforations of the appendix and their consequences. Even those who protest against this confusion and seek to maintain the specialization of the clinical type of typhlitis, when they come to the verification of this by the findings of the autopsy, report only observations of perforation of the appendix, or obscure and complex cases of which the interpretation may vary at the will of the critic.

The first objection, then, which we wish to make to the typhlitis of Albers, is that it is without anatomo-pathological proof. Let us now see into what elements this artificial conception may be decomposed.

2. PERITYPHLITIS AND ILIAC PHLEGMON.

The first and most important element is the purulent collection forming a tumor in the right iliac fossa. This tumor is the phenomenon which first attracted attention, as is proved by the title of the memoirs of Husson and Dance,¹ of Menière and Grisolle, "*On phlegmonous tumors of the iliac fossa.*" According to Grisolle, the iliac abscess dominates the situation to this extent, that the gastro-intestinal symptoms are nothing but digestive disturbances such as may be observed in any febrile affection.

But Dance and especially Menière have looked at the question in the same way as Albers, and they may be regarded antecedent to him as the real inventors of typhlitis. Their observations, in fact, correspond exactly to the classic symptomatology and to the type which we shall describe further on under the name of sub-acute appendicitis; alternations of constipation, of diarrhœa, and colic continuing for

¹ Published in 1827.

weeks and months, fixed pain suddenly manifesting itself in the right iliac fossa, then the appearance of a painful tumor, which under the influence of leeches, of purgatives and lavements; progressively subsides at the end of a variable time.

Menière even reports two cases in which he declares that the swelling could only have been produced by the tumefaction of the walls of the cæcum and colon; it was in fact the simple typhlitis of Albers.¹

At the same time, he notes these observations without making much account of them, and he speaks of the tumor in the right iliac fossa as always dependent on inflammation of the peri-cæcal cellular tissue. While recognizing etiologically the determining part which the cæcum takes in this cellular inflammation, Menière admits and describes only perityphlitis.

For him, as for Dance, the iliac tumor is seated in the cellular tissue; it is a phlegmon which may terminate by resolution—and he indicates the frequency of this mode of termination,—or by suppuration, the abscess opening externally, or into the intestine or bladder. In certain cases, moreover, the inflammation may be propagated to the peritoneum, and the iliac phlegmon is complicated with peritonitis.

This view of Menière, that the secondary inflammatory lesions occupy the peri-cæcal cellular tissue, became and remained till the last few years, like the notion of Albers that the primary lesions are seated in the cæcum, the expression of the truth for the greater number.

At the same time, pathological anatomy does not enable us to verify either view. Of three things, one will take place: either the tumor will undergo resolution, or the abscess will

¹Husson and Dance. *Répertoire d'anat. et de phys.*, 1827, t. iv. Menière, *Tumeurs phlegmoneuses occupant la fosse iliaque droit*. *Arch. de Méd.*, 1828, t. xvii. Grisolle. *Tumeurs phlegmoneuses des fosses iliaques*, *Arch. de Méd.*, 1839.

burst or be opened by the bistoury, or the patient will succumb.

In the case of the tumor undergoing resolution, no conclusion can be drawn respecting the precise seat of the lesions.

In the second case, no certain data are afforded, whether the abscess open of itself or be opened. How are you going to tell whether the pus came from the sub-peritoneal cellular tissue, or from the peritoneum, after localization and encystment of the inflammation?

In the third case the subject succumbs; does the autopsy furnish a decisive answer?

First, it tells only what is found in this particular case, and logically, one is scarcely warranted in generalizing without the most thorough examination. Then such autopsies are very rare, which fact commands and justifies a prudent reserve in making deductions. Lastly, look over the published autopsies, and see how difficult it is to understand the proper relation of parts when the tissues of the region are disorganized by a long suppuration. Without doubt, in some cases the abscess seems to be extra-peritoneal; but generally one finds at the same time united the inflammation of the cellular tissue and that of the peritoneum, and in the midst of muscles softened, infiltrated, gangrenous, of pus-pockets, of organized bands and intestinal adhesions, it is materially impossible to decide if the suppuration began inside or outside of the peritoneum, if it was first an iliac phlegmon or a limited peritonitis.

Like the affirmation of Albers, respecting the primary seat of the pretended typhlitis, the affirmation of Menière respecting the cellular tissue localization of the pericæcal lesions lacks anatomical basis, nor does normal anatomy give it any more support.

It has long been taught that the cæcum is incompletely covered by peritoneum, being only invested by that membrane on its anterior and lateral aspect, while behind, it is directly in contact with the cellular tissue of the iliac fossa. Bardeleben, Henle, Luschka had, however, maintained the contrary. The researches of Treves have shown that the old opinion

is false, that the peritoneum envelops the cæcum completely, as well behind as in front, and that the first portion of the large intestine is free in the peritoneal cavity as is the point of the heart in the pericardium.¹ Tuffier, in France, has confirmed this datum. In 120 cadavers, he found but nine exceptions to the rule; in these cases, the peritoneum was wanting, but only over a part of the cæcum, viz., the upper third of its posterior aspect.² And Maurin, on examining more than 100 subjects, has verified the constant exactitude of the anatomical description of Treves.³

It is then impossible to admit, as a general rule, the process indicated by Menière. The iliac tumor is not due necessarily to an inflammation of the pericæcal cellular tissue. This we shall make plainer farther on.

As for the word *perityphlitis*, it may be retained, but we must enlarge the restricted signification which the standard treatises have given to it, *i. e.*, of a phlegmon consecutive to perforation of the posterior aspect of the cæcum. We must understand by typhlitis every inflammation, peritoneal or extra-peritoneal, exudative or suppurative, produced in the immediate vicinity of the cæcum or its appendix, as a direct consequence of lesions of these organs.

¹ Treves, Hunterian lectures, Brit. Med. Jour., 1885.

² Tuffier, *Arch. gén de Med.*, 1887, t, xix.

³ Maurin, *Essai sur l'appendicite*, (These de Paris, 1891.)

3. STERCORAL ENGORGEMENT OF THE CÆCUM.

The accumulation or stagnation of fæcal matters in the cæcum is one of the bases of the theory of typhlitis. We do not deny this stercoral engorgement. But the question is to ascertain:

1. If this stagnation exists in conditions where so important a pathogenic rôle can properly be ascribed to it?
2. If the accumulation of fæcal matters is capable of determining an inflammation of the mucous membrane of the cæcum?
3. If this accumulation, even supposing that it provokes an irritation of the large intestine, gives rise to the classic symptoms of typhlitis?

The stagnation, the cæcal constipation exists, that is not disputed. It may be observed, first, in the victims of incorrigible constipation, as a natural consequence of intestinal torpor. The fæcal matters accumulate ordinarily in the sigmoid flexure, but if the evacuation becomes insufficient, the engorgement ascends, little by little, gains the entire colon, and the cæcum in its turn becomes obstructed.

It is next observed in the course or as a sequel of an attack of simple appendicitis, whether because the anti-peristaltic contractions of the large intestines, provoked by the irritation of the appendix, force back the fæcal matters into the right cul-de-sac, or because the muscular coat of the cæcum being paralyzed by reason of a violent painful excitation, the fæcal contents of that gut cannot pursue their normal course towards the rectum, and accumulate in the first part of the large intestine distended by atony.

But is this accumulation capable of provoking a true inflammation of the cæcal mucosa? Munchmeyer and Behier say this is impossible. Munchmeyer, combating the doctrine of Albers, does not believe in stercoral typhilitis. He thinks that generally there is no inflammation of the cæcum, even after a considerable and prolonged dilatation of the organ. He reports several cases where the cæcum had attained enormous dimensions, those of the stomach in an old woman of sixty-two years, those of the gravid uterus at the seventh month; the symptoms were those of internal strangulation, but there were no inflammatory phenomena.¹

Behier does not any more than Munchmeyer believe in the irritant action of fæcal matters on the mucosa. He thinks that the stercoral stagnation is insufficient to determine an inflammation. He appeals to the argument that we see every day individuals affected with obstinate constipation with considerable accumulation of fæcal matters and who present no symptom of intestinal inflammation.

It is nevertheless commonly held that the prolonged contact of indurated fæcal matters determines a special irritation of the mucosa of the large intestine, a muco-membranous irritation which manifests it-self by the signs of glairy or membranous entero-colitis, with expulsion of viscous mucosities resembling the white of egg, or pellicles more or less thick looking like bits of tape-worm or filaments of macaroni. Although we may contest the explanation given, and maintain that the formation of indurated scybala is itself but the

¹ Munchmeyer, *Deutsch, Med. Klin.*, 1860.

consequence, and not the cause of the secretory and motor troubles of the intestine. let us concede this pathogenetic role of the fæcal matters. In every case, the irritation thus provoked is purely superficial, and never ends in limited ulceration or gangrene of the walls of the intestine. That this secretory irritation may exist in the cæcum at the same time as in the rest of the colon is possible; but there is nothing here comparable to an acute inflammation propagating itself to the divers coats of the cæcal cul-de-sac and causing perforation.

May this superficial irritation at least provoke the clinical phenomena which are said to characterize typhlitis? Membranous colitis determines dull colicky pains, meteorism, sometimes indeed pains in the abdomen of an intense character with elevation of temperature, or phenomena which simulate internal strangulation, but nothing which resembles the local symptomatology of appendicitis, and it is for the physician to know how to differentiate and diagnosticate the consequences of the two affections.

The evils which result from prolonged fæcal obstruction of the colon and cæcum have been sometimes sufficiently grave to cause death. Do we observe in these cases the symptoms of stercoral typhlitis? By no means. Do we find at the autopsy ulcerous lesions of the colon and appendix? Never. The following case by Harley in Vol XI. of the Reports of St. Thomas Hospital show well that this fæcal engorgement of the cæcum has nothing in common with the symptoms or lesions of appendicitis.

“A young boy 17 years old was admitted moribund to the hospital in such a state of prostration that no information could be elicited from him. Body extremely emaciated; skin dry and cold; hands and feet violet color; eyes excavated; pulse filiform; tongue moist and heavily coated; belly was not tympanitic or distended; doughy feel, without elasticity. No pain. Patient died next day.

At the autopsy, the small intestine was found empty; the mucosa injected and covered with mucus of purulent aspect; all the large intestine from the orifice of the appendix to two inches from the anus was absolutely stuffed with fæcal matters. The colon was contracted on its contents so as to appear knotty or bead-like. The cæcum was filled with a voluminous mass of fæces weighing over a pound. These matters being removed, the mucous membrane appeared to be covered with a thick yellowish mucus, and in divers points, principally in the cæcum, it presented the signs of a lively inflammation. The other viscera were healthy.”¹

¹ J. Harley. Fæcal retention especially as it affects the cæcum. (*Loc. cit.*, p. 128.)

This patient died, it would seem, of stercoræmia, but surely he presented no symptoms of typhlitis, and yet the mucosa of the cæcum was inflamed where it was in contact with fæcal matters.

We may then admit that the stercoral engorgement of the cæcum is capable of provoking a certain degree of mucous inflammation, although, for our part, we believe that it is oftener rather the effect than the cause of this inflammation, but we cannot agree that the fæcal stagnation determines by itself the morbid syndrome described under the name of typhlitis.

4. ILIO-CÆCAL PERFORATIONS.

The perforation of the appendix vermiformis, as a pathological fact, has been long known. About the middle of the last century, we find cases reported in the *Journal Général de Médecine et de Chirurgie*. The first in date is that of Mestivier published in 1759. Mestivier gives the history of a man aged 45 years, who entered the Hospital St. André de Bordeaux to be treated for a tumor situated near the umbilical region on the right side. The tumor was fluctuating, was opened, and a pint of pus was discharged. The patient died. At the autopsy there was found as the starting point of the abscess a pin encrusted with earthy matter which had perforated the appendix.

This was only a case of traumatic appendicitis; That of Wegeler published in 1813 is a clear example of stercoral appendicitis:

A young man aged 18 years is attacked with slight colicky pains which continue for three days, then there supervenes an intense, continuous, circumscribed pain in the right iliac fossa,

increased by pressure; the belly is tense. there is constipation preceded by slight diarrhœa. Hiccough, retching and vomiting, first porraceous, then fœcaloid. The next day, pinched features, cold extremities, and death during the night.

Sectio Cadaveris.—General peritonitis, cæcum gangrenous. This morbid change, said the writer, seemed to have commenced in the appendix, which was red, voluminous and contained several calculi of which the largest weighed about a gramme.¹

The two observations of Louyer-Villermay² are similar.

But the memoir of Melier, which appeared in 1827 in the *Journal général de médecine* is one of the most remarkable and merits a detailed analysis. After having cited the two observations of Louyer-Villermay, Melier reports four cases of which he had personal knowledge. The three first are cases of perforative appendicitis with fulminant peritonitis; the fourth a case of relapsing appendicitis. One of the cases was first thought to be only simple indigestion; another to be probably internal strangulation. It will be seen that these are, in fact, two of the aspects under which appendicitis often presents itself.

Melier insists upon the existence in the three first cases of two distinct phases, the one of abdominal colics more or less severe, the other of fixed pain localized in the right iliac fossa, followed by all the signs of acute peritonitis. "The patient," he says in commenting on his first case, "was subject to attacks of colic; he had had an attack of this kind for several days; he had partly recovered from these pains, when all at once in the midst of the lull, an intense pain came on in the lower part of the belly, followed by symptoms of spreading peritonitis and death in 18 hours."

¹ Wegeler, Jour. de Méd. et de Chir. de Corvisart, 1813.

² Louyer-Villermay, Arch. gén. de Méd., 1824.

The two phases of the affection, appendicular phase and peritoneal phase, are here clearly indicated. Melier, moreover, has a clear notion as to the interpretation of the accidents.

“I explain in this way the divers accidents and their succession. Fæcal matters had accumulated in the appendix, which became dilated, then obstructed, by degrees inflamed, then gangrenous, lastly perforation occurred. The first accidents *i. e.* the colicky pains, were probably due to the distention and inflammation of the appendix. Its rupture gave rise to the effusion which itself seems to have been the cause of the peritonitis.”

While mentioning the apparent rarity of these affections of the appendix, he adds: “Remark, nevertheless, that the four cases which are the subject of this memoir have been collected in a rather short interval of time, and two of them occurred in the practice of the same physician; which leads me to believe that if these affections have not been oftener observed, it is because sufficient attention has not been given to the appendix, an organ regarded as of little importance, and of which the lesions are unnoticed at the autopsy because physicians neglect to look for them.”

He takes care, moreover, to state that these inflammations of the appendix should be distinguished from fæcal accumulations in the cæcum and colon, a very common affection, in his estimation, especially in women. This stercoral accumulation gives rise to symptoms quite different from the lesions of appendicitis, symptoms which, from their similarity to what takes place where there is retention of urine, he proposes to describe under the name of *stercoral fever*.

Lastly, not only did Melier exactly see and explain the causes, the character and consequences of appendicitis, but he had an inkling of, and indicated the possibility of the surgical treatment.

“If it were possible,” says he, “to establish with certainty the diagnosis of these affections, we can see the possibility of curing the patient by an operation. We shall perhaps some day arrive at this result.”¹

Thus Melier had seen and understood the preponderant rôle of appendicular lesions in inflammations of the right iliac

¹ Melier. *Memoir and observations on certain diseases of the appendix vermiformis.* *Jour. de Méd. de Chir. et de pharm.* 1827 p. 317.

fossa, and this to the exclusion of the pretended fæcal engorgement of the cæcum. It only remained to follow out the path so well indicated and traced by him in order to rapidly arrive at the point to which the question has been brought to day, but only after having for sixty years deviated from its point of departure.

The memoir of Menière which appeared the following year, the notion that the lesions occupy the cellular tissue of the right iliac fossa, later on, the memoir of Albers, caused the work of Melier to be completely lost sight of. Pathologists henceforth saw and wished to see only the cæcum; they invented for the cæcum a special pathology and even physiology; and the appendix continued to be regarded as "an organ of little importance, and of which at the autopsy all alike neglect to note the lesions."

From time to time, however, appeared memoirs such as those of Bodart, of Favre, of Forget, of Leudet, adding new facts to the observations of LouyerVillermay and of Melier.¹ But all these writers tend to separate the consequences, or these perforations from the lesions and symptoms attributed to typhlitis. They saw in the perforation only an accident always fatal, and the cause of the general peritonitis.

Thus, little by little the view became prevalent which still counts a few advocates, but which will henceforth count fewer and fewer, that the grave and fatal forms of typhlitis are due to perforation of the appendix, the benign and curable forms to an inflammation of the cæcum and cellular tissue which surrounds it.

5. THE APPENDICITIS OF AMERICANS.

The surgeons and physicians of the United States have restored the question to the status to which Melier had advanced it, and by their early operations have demonstrated that in every case, grave or

¹ Bodart, *Th. Paris* 1844. Favre, *Th. Paris* 1851. Forget, *On peritonitis by perforation of the appendix vermiformis*. (*Gaz. Méd. de Strasbourg*, 1855.) Leudet, *Arch. gen. de Méd.*, 1859.

benign, the appendix is always the primary seat of the lesions.

The epoch-making memoir on this subject is the paper of Reginald Fitz, of Boston, published in the *American Journal of Medical Sciences* for October, 1886, "On Perforative Inflammation of the Vermiform Appendix." In this work Fitz collected 209 cases of typhlitis and perityphlitis, and 257 cases of perforative appendicitis. He showed that the symptoms are the same in the latter as in the former class of cases. He studied with care the consequences of perforation. He established the fact that the peritonitis is not always generalized, that it may be circumscribed under the form of an encysted purulent collection. He gave the characters of the tumor formed by this localized peritonitis, the different modes of the evacuation of the pus, the complications that may supervene if the disease is left to itself. He insisted on the frequency of fæcal concretions as a cause of the perforation of the appendix. He concludes in favor of early surgical interference.

It is only just to say that most of these facts had been pointed out before in Europe. In 1879 Biermer said that perityphlitis is always the consequence of a perforation of the appendix caused by a stercoral concretion. Matterstock, in 1880, called attention to the frequency of concretions in the etiology of these perforations. With, at the Congress of Copenhagen, declared that the lesions of appendicitis may occasion three kinds of peritonitis; a generalized peritonitis, a circumscribed peritonitis, and an adhesive peritonitis. He even affirmed that the typhilites which terminate by resolution are nothing but adhesive appendicular peritonites. I myself, in

1882, in calling attention to the pathogenic role of scybala, showed that the foreign body does not perforate the appendix after the manner of a traumatic agent, but in strangulating or obstructing the circulation of the walls of the canal, it favors the microbic inflammation of these walls and consequently their gangrene and ulceration.

Pathologists could now no longer overlook the importance of the rôle of the appendix, yet they none the less continued to admit along with perforative inflammations of this organ, cæcal and pericæcal inflammations having their origin in the cæcum.

In a second paper, the complement of the first, Fitz in 1888 took the radical but scientific position that the states described under the names of typhlitis, of peri or para-typhlitis, of appendicular peritonitis, or perityphlitic abscess, were all nothing but phases or varieties of one and the same affection, inflammation of the appendix veriformis, or appendicitis.¹

We have here the gist of all the discussions and memoirs pertaining to typhlitic affections which have appeared in the United States during the past six years.

Although no didactic description has been given of appendicitis, and all the writings which pertain to the subject are found scattered in the journals and reports of the medical societies of Boston, New York and Philadelphia, it is easy to see that there is unanimity among American authorities,² on this point

¹ Reginald Fitz, *New York Medical Journal*, May 12, 1888.

² MacBurney, Bull, J. Lewis Smith, Sands, Weir of New York, Porter, Elliot, Warren, Monks, Worcester, and Richardson, of Massachusetts, MacMurtry of St. Louis, Keen, Morton, Price of Philadelphia, Senn of Chicago, etc., etc.

that whenever the surgeon operates for relief of symptoms attributed to typhlitis or perityphlitis, it is always the appendix which he finds primarily affected.

This same notion I have myself defended from a medical and pathogenic point of view in a series of articles published last year in *La Médecine Moderne*; and I have shown how perfectly all the symptoms of typhlitis are explained if we locate in the appendix the first cause of the irritation. The present work is but the development of this pathogenetic theory applied to the clinical evolution of the divers forms of appendicitis; and as for the description of these forms, we may say that it is based entirely on the result of the American operations.

These operations, made very early, from the second or third day of the disease, and often for cases which would have got well by medical treatment, have enabled us to study *de visu* all the varieties of appendicitis, from those slight forms where hardly any lesions exist, to the most grave forms with localized or diffuse peritonitis.

They also show that there never or almost never exists inflammation or perforation of the cæcum; not once in 200 cases according to MacMurtry.¹ If we refer to the statistics of writers who still admit the existence of a typhlitis distinct from

¹ MacMurtry, *Med. News*, Jan. 10, 1892.

appendicitis, those of Maurin, for instance, who has collected 136 cases occurring in France, we shall find that the appendix alone was the seat of lesion in 94 cases, the cæcum alone in 36, the appendix and the cæcum in six. But if we analyze these 36 cases where the cæcum is considered as alone the seat of lesion, in 20 the disease terminated in recovery, *i. e.*, there was no means of determining the real seat of the lesions, and it was solely by traditional conviction that these cases were attributed to an alteration of the cæcum rather than to a lesion of the appendix; in two the cæcum was perforated by a foreign body, a pin or a fish bone; in two, it is indeed said that the cæcum presented some redness and injection of the mucosa, but no mention is made of the appendix; in 12 only it is distinctly noticed that the cæcum was the seat of a perforation. We still wish to know if in these twelve cases the perforation was really the result of simple inflammation, if it was not due to a tuberculous ulceration, if sometimes it was not secondary to the bursting inward of a peri-cæcal abscess; conditions, all of them, concerning which the statistics are silent.

We are, in fact, warranted in distrusting these old observations, taken at a time when the true rôle of the appendix was not suspected, and we only regard as trustworthy, facts collected with full knowledge of causation. If you read the two memoirs of Roux, of Lausanne, which assigns the origin of the malady

sometimes to the cæcum, sometimes to the appendix, you will see how little remains of the typhlitis of Albers. But of 47 cases where Roux, on opening the abdomen was able to verify the seat of the primary lesions, in 46 he found the appendix inflamed or perforated; and in one only the appendix was sound and the symptoms were due to a perforation of the cæcum.

We shall presently consider the part which belongs to the cæcum in certain periods of the disease, but it is very evident that the part which it plays in the pathogeny of the accidents must be ascribed wholly to the appendix vermiformis.

6. APPENDICULAR COLIC.

The American writers have had chiefly in view the practical and surgical side of the question, and have scarcely touched upon the pathogenic side. While setting forth and illustrating the frequency of foreign bodies and especially of scybala as cause of perforative appendicitis, they have limited themselves to noting the fact without seeking to penetrate the mechanism of the perforation.

Moreover no one has yet explained the sudden mode of onset of the symptoms, the attack of colic which precedes the perforation, and which in some cases almost constitutes the disease in its entirety.

The suddenness of the onset is nevertheless quite peculiar and characteristic. This fact taken into con-

sideration along with the frequency of stercoral calculi in the cavity of the appendix, inspired me with the idea of the pathogenic theory indicated in a number of my journal for 1890, and which seems sufficient to explain the different varieties of appendicitis.¹

We compare the diverticulum of the appendix to a musculo-membranous tube like the choledochus or ureter for instance. A gall-stone in becoming engaged in the choledochus, determines an attack of hepatic colic, with its characteristic symptoms: sudden onset, local pains, radiating and paroxysmal pains, vomiting. The same effects result from the engagement of a uric acid-calculus in the ureter.

So also an intestinal concretion, on suddenly penetrating the appendicular canal, provokes a sudden pain localized in the right iliac fossa, pains radiating and paroxysmal under the form of intestinal colic, predominating especially in the right side of the abdomen, vomiting, and constipation by reason of paresis of the large intestine. Are not these symptoms exactly those of the affection called typhlitis simple or stercoral? According to the old view, they are due to intestinal obstruction, but the arrest of fæcal matters is posterior and not anterior to the attack of pain. The constipation, like other symptoms, is due not to an obstruction, which does not exist, but to the reflex irritation

¹ Charles Talamon, Appendicitis and Typhlitis. *Médecine Moderne*. Jan. 19, 1890.

of the mucous membrane of the appendix, just as the pain, the vomiting, and constipation of hepatic colic are provoked by a reflex irritation starting from the mucous membrane of the choledochus.

Even the faecaloid vomiting which may supervene in appendicitis, in no sense implies an obstruction of the intestine. We know that this kind of vomiting is observed in cases of intestinal paresis without any mechanical obstacle to the passage of faeces.

The painful crisis of appendicitis with sudden onset is due, in my judgment, to the same cause, penetration of a hard body in a narrow and sensitive duct; and the same mechanism, a painful irritation reflected upon the innervation of the neighboring organs, as is the case with hepatic and nephritic colic. We call it consequently appendicular colic, and believe that this appendicular colic may sometimes exist by itself, sometimes represent the first phase of morbid accidents which end in perforation of the appendix and in general or local peritonitis, the consequence of this perforation.

If the first effects of the engagement of the calculus are the same in the appendix and in the choledochus, the secondary effects of the obstruction differ in the two cases. In hepatic colic, the morbid accidents may cease in two ways; either the calculus falls back into the gall-bladder or it gradually passes down into the intestine. In appendicular colic, the pain will cease by only one mechanism, the expulsion of

the coprolith into the cæcum; the disease then goes no farther than an attack of colic and a certain degree of appendicitis.

As in hepatic colic, moreover, a first attack favors the production of new attacks, by leaving the orifice of the canal dilated and more ready for the engagement of new concretions; in other words, the patient is subject to recurrent or relapsing appendicitis.

In hepatic colic, if the calculus remains engaged in the choledochus the sole consequence is chronic icterus. This enclavement may persist for weeks and months without any other consequence. The perforation of the canal at the level of or behind the obstacle is a rarity, despite the pressure exercised by the bile which continues to be secreted, because the bile is an aseptic liquid and there exist no microbes in the normal state on the surface of the biliary mucosa. In appendicitis, on the contrary, perforation is the rule, because the parietes, deprived of their vitality by compression of the vessels, no longer offer any resistance to the penetration of the bacteria which multiply and thrive in the dilated cavity.

7. THE PART OF THE CÆCUM.

It will be seen that we completely dispossess the cæcum of the rôle which tradition has assigned to it in the production of the morbid accidents described under the name of typhlitis. Neither the tumor, nor the pain, nor the inflammatory phenomena are due to any lesion of the walls of the cæcum proper.

But do we mean by this that this part of the large intestine may not be the seat of morbid alterations whose predominance

at this level determines sometimes symptoms more or less similar to those of appendicitis or to those of appendicular peritonitis? Certainly not. We do not dispute the existence of ulcerations of the cæcal mucosa in the course of dysentery, typhoid fever, of tubercloses, of syphilis, even. Intestinal tubercloses may even begin by the cæcum. On the other hand, Bauhin's valve (ileo-cæcal valve) is one of the seats of predilection of cancer of the intestine.

All these lesions may give rise to signs of pain and of swelling localized in the right iliac fossa which are liable to be confounded with the symptoms of subacute appendicitis with insidious march. I shall return to this subject when I come to diagnosis.

We may, if we wish, give to these lesions the names of typhlitis-dysenteric, typhoid, tuberculous, cancerous,—but in my judgment this would be wrong; first, because in accordance with the classic conception of typhlitis, these specific alterations of the cæcum have generally been classified apart and distinguished from inflammatory typhlitis properly so called. In the second place, these lesions—with the exception of cancer—are very rarely exactly limited to the cæcum, and ordinarily extend to other parts of the large intestine. Lastly, it is very exceptional that ulcerations of this kind give rise to symptoms which one feels inclined to specialize and to localize in the cæcum. And here is just one of the most striking arguments against the existence of this pretended stercoral typhlitis. When cæcal lesions exist, tangible and indisputable, the symptoms and signs of typhlitis are lacking. What right have we when these signs and symptoms are present, to refer them to an inflammation of the cæcum, when no one has ever seen any such inflammation attended with such symptoms?

It may be asked whether in the course of appendicitis with or without perforation, the cæcum may take part in the morbid process? Without doubt the cæcum may be interested, but always in an accessory and secondary manner.

1. By the very reason of its propinquity to the perforated appendix, the peritoneum which envelops the cæcum is always the most rapidly and the most profoundly affected; it is here that the false, fibrinous membranes are the thickest and most abundant.

2. The appendix being very often applied against one of the sides of the cæcum, the purulent collection, consequence of the appendicular perforation, often points behind or on one

of the lateral aspects of this part of the colon. If the abscess is left to itself, it frequently bursts into the cæcum, perforating its coats from without inwardly; this is one of the modes in which pus is evacuated, and one of the ways of recovery in perityphlitis.

3 During a crisis of appendicitis one will sometimes (though rarely) feel in the right iliac fossa an elongated tumor, more or less cylindrical, of pasty or hard consistency, formed by fæcal matters accumulated in the cæcum. This tumor which, to the advocates of stercoral typhlitis is the very cause of the morbid accidents, is really only the consequence. It is never felt in the onset of the disease, but only after several days when the pain is assuaged and the contractions of the abdominal muscular plane are in the process of giving way; and it is scarcely ever noticed except in recurrent appendicitis after one or more crises of appendicular colic. The accumulation of fæces is brought about, both by reason of the antiperistaltic contractions of the large intestine, consecutive to the painful excitation of the muscular coat, fæcal matters which normally belong to the second half of the colon being forced back into the cæcum; and by reason of paralytic atony of this same muscular coat, which, being violently excited during the painful crisis, becomes then powerless to propel the fæcal masses in their ordinary direction.

4. This paralytic atony with fæcal stagnation may be replaced in other cases by an atony with gaseous dilatation. You will perceive then in the cæcal region an exaggerated tympanitic sonorousness, accompanied by localized borborygmi. The motor paresis which is predominant in the cæcum, exists moreover in the whole of the large intestine, and this explains the obstinate constipation from which persons affected with relapsing appendicitis suffer.

On the whole, the signs furnished by the examination of the cæcum are those of simple paretic distention and not of inflammation. These signs are always secondary, and consecutive to the appearance of the symptoms due to appendicitis.

Ulcerous inflammation of the cæcum, however, exists in divers specific diseases; but this inflammation rarely, if ever, gives rise to a symptomatology offering any similarity to that of classic typhlitis.

In order that the symptoms described under the name of typhlitis may be produced, it is necessary that the appendix shall be primarily affected.

II.

THE LESIONS.

8. THE APPENDIX VERMIFORMIS.

The appendix vermiformis is a diverticulum of the large intestine attached to the postero-internal part of the cæcal cul-de-sac, or *caput coli*. It is an atrophied organ, a rudimentary vestige representing in man the developed cæcum of Herbivora and Rodents. Confounded during embryonic life with the large intestine, it contracts little by little and becomes reduced at the moment of birth to the size of a goose-quill, while preserving a variable length. It would be useless to discuss the functions and physiological rôle of the appendix; it has none, and the dangers to which it exposes man are alone potent and incontestible. If the physiologist has little interest in the study of this organ, it is not so with the physician who has long had the misfortune to devote to it but slight attention, and to see in its perforations only an accidental traumatism. The appendix is a useless organ, but at the same time an organ essentially injurious.

Its structure does not differ from that of the intestine; the walls are composed of four coats which, from within outward are: the mucosa, containing tubular glands and perhaps closed follicles; a connective tissue stratum separating the mucosa from the

muscular coat which is formed of longitudinal and circular fibres; lastly, the serous coat represented by the peritoneum.

The points which interest us in the anatomy of the appendix are its dimensions, situations and exact relations with the peritoneum.

1. *Dimensions.*—Its *dimensions* are extremely variable. Sappey ascribes to it the average size of a goose-quill, and a length of 6 to 12 centimetres. But cases are cited where the appendix was found no larger than a little tubercle (Merling), or where it was absolutely wanting (Ferguson), and others where it had attained the length of 25 to 50 centimetres, with a size equal to that of the finger.

Ferguson, who has examined with care and measured 200 appendices, gives as the average length $4\frac{1}{2}$ inches, and for diameter that of a No. 9 English sound. In three cases the appendix was only a half-inch long, and in one there was no trace of this organ to be found.¹

Normally, the internal canal is very narrow as compared with the thickness of the walls. Besides, the orifice of communication with the cæcum is ordinarily half-closed by a semi-lunar fold of mucous membrane called the *valve of Gerlach*. In normal conditions, then, it is not easy for a foreign body to penetrate the appendicular canal; it can enter only by effraction (so to speak), by forcing the orifice and dilating the caliber of the duct.

2. *Situation.*—The *situation* of the appendix in the abdomen is important to know, now that the excision of this organ has become an operation of such frequent occurrence. There are two points to determine: its insertion in the cæcum and its general position in relation to the intestine. The insertion takes place at the posterior and internal part of the head of the colon. This point corresponds to the middle of a line drawn from the anterior superior spine of the ilium to the umbilicus.² This is the point of maximum intensity of the

¹ Ferguson. Some points regarding the Appendix Vermiformis (Am. Jour. Med. Sc., January, 1891.)

² MacBurney's point.

fixed pain which indicates inflammation of the appendix, and it is there that you are to seek for the organ when you wish to tie it and resect it.

As for the position of the free part and its relations with the neighboring organs, they are far from being always the same. In the 200 cases studied by Ferguson, the direction and the situation of the appendix were the following:

In 19 cases the appendix was placed on the external aspect, on the right side of the cæcum ; in 11 its direction was downwards ; in 18 its direction was inwards ; in 75 it was in relation with the posterior part of the cæcum. Lastly, in 77, it was so placed in the iliac fossa that its perforation would necessarily take place into the retro peritoneal cellular tissue, and would thus cause an abscess in the iliac region.

Remark the frequency of its relation with the posterior face of the cæcum. In this position Sappey says that he has seen the appendix ascend as high as the lower border of the liver, and enter into contact by its extremity with the gall bladder. Hartley in 15 cases found the appendix behind the head of the colon in eight ; behind and a little inward, once ; below and in part behind, once, below and in relation with the anterior abdominal wall, once ; below and in part on the anterior aspect of the cæcum, once : on the brim of the pelvis inside the cæcum, once ; on the internal aspect of the cæcum, once ; on its anterior aspect, once.¹

According to Briggs (Post Graduate, New York, November, 1889), in almost three-quarters of the cases the appendix is directed below and inwards ; in a little more than one-fourth of the cases it is situated behind the cæcum and ascending colon.

These variations of relation and direction of the appendix explain several things : 1. How palpation, in endeavoring to localize the pain and tumefaction, may lead to the belief in an inflammation of the cæcum when there is only a lesion of the appendix attached to the cæcum ; 2. How purulent collections of appendicular origin do not always occupy the same seat, since the perforation of the appendix may take place sometimes inwardly, sometimes outwardly, sometimes behind the cæcum ; 3. They show lastly, how the surgeons who even to-day rely on the seat of the purulent collection in establishing a distinction between appendicitis and perity-

¹ N. Y. Med. Rec., August 16th, 1890.

phlitis, and in maintaining that not every perityphlitis is in relation with a lesion of the appendix, only display by such reasoning their ignorance of the variable anatomical relations which the diverticulum may present.

3. *Relations with the peritoneum.*—A last detail, of no less interest to determine, is the relation of the peritoneum to the appendix. Most anatomists have claimed that the appendix as well as the cæcum is incompletely covered by the serosa, and that, as a general rule, a part of its circumference, the posterior and superior portion, is in direct contact with the subperitoneal cellular tissue.

The attentive study of the region proves the contrary. Maurin says that out of 112 subjects of all ages, he has in all of them seen the appendix completely surrounded by the serosa, and quite free in its cavity.¹ One may well think that Maurin fell upon a special series of subjects, for it cannot be denied that in a certain number of cases the appendix is in direct relation with the retro-cæcal cellular tissue. Ferguson's statistics seem to me more conformable to the reality.

In 200 cases, Ferguson found the appendix in 123 invested with its proper mesentery and free in the peritoneal cavity. But in 77 of these cases the appendix was covered by peritoneum "in such a way that perforation could only take place into the sub-peritoneal cellular tissue, thus producing a diffuse form of cellulitis."

As a general rule, the appendix then, floats freely in the abdominal cavity, but in a third, at least, of the cases it is in contact, in a part of its length, and sometimes in its whole length, with the sub-peritoneal connective tissue.

4. *Frequency of appendicular lesions.*—The researches of the past few years have established the frequency of lesions, which take place, in a more or less latent manner, in the interior or on the exterior of the appendix.

Hektoën, of Chicago, and Maurin have noted the exterior alterations. The first, in 280 autopsies found adhesions in 42, the vestiges of a former peri-appendicitis (15 per cent.). Maurin, in 112 autopsies, found in 16 peri-appendicular adhesions, the relics of localized peritonites, "while nothing in the antecedents of the subjects had ever called attention in that direction."

The examinations of Toft pertained both to the external

¹ Maurin. *Loc cit.* p. 7.

aspect and the internal cavity of the organ. In a total of 500 autopsies Toft noted evident signs of appendicular lesions in the proportion of 36 per cent.

The proportion indicated by Ferguson is considerably less. Out of 200 post-mortem examinations he found only seven cases where there was evidence of old lesions or of perforation. In three of these cases it was in fact proved that there had been perforation in a past time. In 15 cases there were found foreign bodies in the canal of the appendix, fruit seeds, scybala, etc.

In summing up these different statistics we may then conclude that in 20 per cent. of cases we meet with appendicular lesions, internal or external, at the autopsy of subjects who have succumbed to divers affections.

Are we to infer that these old lesions, intra or extra appendicular, remained absolutely latent during life? Or did they manifest themselves at a given moment by symptoms, more or less plain, of an abdominal affection? It is impossible to say, as the statistics do not give us any clinical information. It nevertheless seems difficult to admit, considering the susceptibility of the peritoneal serosa, that these lesions could have remained completely silent or latent. On the other hand, Maurin took care to note that nothing in the antecedents of his 16 patients gave any hint as to the lesions which were found at the autopsy. If, then, these patients had at any time any abdominal symptoms, these were of too little gravity to leave behind anything but a vague remembrance of a disorder for which they did not deem it necessary to call a physician.

We are then justified in thinking that appendicitis is not necessarily attended with violent symptoms, and that slight and transitory forms occur, whose signs are but little marked, and generally, doubtless, misunderstood, being interpreted as intestinal colic, abdominal neuralgia, etc.

But this frequency of appendicular lesions leads yet to another conclusion of some practical importance. It is not proved that these lesions are always only in relation with light attacks; there are cases where, as in the three patients of Ferguson where the clinical existence of appendicitis with perforation had been noted in the antecedents of the subjects, serious symptoms had been observed during life. We thus have the anatomical proof that grave forms of appendicitis may get well spontaneously, a fact which clinical observation has

no less formally demonstrated, and consequently we find a new justification for the reserve which many manifest in regard to surgical intervention.

9. SCYBALA.

In the anatomico-pathological study of appendicitis one fact ought to be at once made emphatic, namely the frequent, not to say constant, detection of hard concretions or of foreign bodies in the cavity of the inflamed appendix. Out of a total of 760 cases of appendicitis obtained by collecting the statistics and observations of divers authorities, Fitz, Matterstock, Krafft, Fenwick, Maurin, Roux, etc., in 450 the presence of such foreign bodies was noted in the appendix itself, sometimes in the pus of the peri-appendicular abscess (60 per cent). We shall presently see how the absence of concretions or of foreign bodies in observations where the writers make no mention of this important detail is to be explained.

These foreign bodies are of various kinds: sometimes pointed bodies, like pins or fish bones, capable themselves of perforating the intestinal walls; sometimes round, like seeds, pepins, fruit stones, beans, gall stones, or intestinal calculi; lastly, hard fæcal balls, or scybala.

The comparative frequency of these different varieties of foreign bodies deserves a moment's attention. Scybala are by far the most frequent of all. Thus Reginald Fitz in 132 cases found scybala in 47 per

cent; Matterstock in 57 out of 69 cases; Kraft in 36 out of 40 cases; Maurin in 34 out of 60 cases. Fenwick's figures alone differ in the result: foreign bodies in 55, and faecal balls in 14 cases.

We may then admit two varieties of appendicitis: a traumatic appendicitis, the perforation being due to direct traumatism by a pointed body, and a stercoral appendicitis—grouping under this head all the cases where the lesions are in relation with the presence of round foreign bodies of which the stercoral concretion is the most common instance.

This distinction between foreign bodies and the faecal concretion has in fact no interest except from an etiological point of view. Abstraction being made of pointed bodies which act by simple traumatism, the mode of action of smooth or round bodies, whether we have to do with scybala, seeds, or calculi, is always the same. It is none the less important to remember that the coprolith represents in the vast majority of cases the real offending body in appendicitis. It is important then to understand the mode and place of formation of these faecal concretions.

1. *Origin of scybala.*—Scybala are little balls of faecal matters more or less hard, having the aspect, the form, and the size of rabbit's dung. They have a brownish color and a variable consistence, being softish at first, hard when they are dried and old. Chemical analysis gives the same composition as that of faecal matters in the large intestine.

It is generally admitted that they are formed in the cæcum, some, however, insist on their formation in the appendix.—Fæcal matters penetrate the appendix in a liquid state and solidify on drying. This appendicular origin of scybala seems very doubtful. If these concretions are formed in the appendix, they would take its form by being moulded to its cavity. They ought then to present an elongated, cylindrical form like that of the duct itself. Now scybala in general, and such as are found in cases of appendicitis, are perfectly round. In order that they may take this spherical form, it is necessary that the particle of fæcal matter which constitutes them should by a process of kneading, rolling, mashing, be worked into that shape by the movement of the intestine in a rather spacious cavity. The cul-de-sac of the cæcum alone offers the necessary disposition for this moulding.

In my opinion the place of formation of scybala is always the cæcum. The particles of matter detached from the fæcal bolus or deposited in the anfractuosities or hernias of the coats (Cruveilhier) which are so easily produced between the longitudinal bands of the muscular layer, take the form of these depressions, then being detached from their primary nest they become round, like bullets under the finger, during the peristaltic movements of the intestine in contact with the resistant plane furnished by the contractions of the cæcal parietes.

It is possible, moreover, that in long and large appendices, such as are sometimes seen, there may be formed by the same mechanism little faecal concretions, but by the very reason of the largeness of the canal they have no importance and cannot play any pathogenic rôle.

2. *Mode of action of the concretions.*—The pathogenic rôle of scybala and of concretions has not escaped the different writers who have observed the perforations of the appendix-*vermiformis*. But on the one hand the rôle which they assign to them is limited to that of agent of the perforation; on the other, they do not indicate how the concretion could produce ulceration of the walls. They content themselves with saying that the perforation of the appendix is in general caused by a stercoral concretion or a foreign body, and they as much as intimate that the scybala or fruit stones, etc., determine directly the traumatism of the walls after the manner of a pin or a fish bone.

But how can we explain how a soft and round body like a scybalum can act upon the walls of the appendix like a pointed body or one furnished with sharp angles? How explain why the entire appendix should be swollen, dilated, inflamed, thickened and in process of gangrene? How also does it happen that in most cases the perforation is not seated in the vicinity of the foreign body, but some little distance below it?

I have repeatedly stated my objections to this theory, and ten years ago proposed the following interpretation of the lesions of appendicitis and of the mode of action of faecal concretions, as well as of fruit stones, gall stones, and other round concretions which may obstruct the appendicular canal.

The foreign body, of whatever nature, being suddenly engaged in the appendix by the inordinate contractions of the caecum, penetrates by effraction and lodges in the upper part of the duct. Two consequences take place: obliteration of the orifice of communication between appendix and caecum, compression of the walls of the appendix and obstruction of the circulation in the vessels contained in its walls.

From obliteration of the orifice result the accumulation of the products of glandular secretion of the mucosa and distention of the appendix; from the compression of the vessels, the diminution of vitality of the organ.

The microbes which exist in permanence on the surface of the mucosa, pullulate and multiply in the stagnant liquid of the closed appendix as in a tight vase. These microbes, inoffensive in the normal state and impotent against the healthy elements, triumph without difficulty over those elements when deprived of their nutrient blood; they multiply without stint, inflaming, destroying and ulcerating the walls of the appendix, and by one or more points, end by perforating them and making irruption into the peritoneum.

Such, in my judgment, is the mechanism of perforations of the appendix, and apart from traumatic perforations by pins, fish bones, and other pointed bodies, and other rare perforations due to specific ulcerations (tuberculous, typhoid, or cancerous) I believe it is the only possible explanation.

What about the cases (about one-third, according to statistics,) where no foreign body is found in the appendix at the autopsy or laparotomy?

In many cases, the omission to mention the presence or absence of a foreign body may have been due to neglect to look for any. Such negligence has been sufficiently common in the past. In other instances three alternatives are possible: Either the foreign body, half engaged, and fixed only at the superior part of the appendix, falls back into the cæcum, the tension of the walls which keep it in place, giving way at the moment of perforation; or else, in contact with the liquids accumulated in the duct, the scybalum becomes softened and transformed into a semi-fluid mass, grayish or greenish, such as has been noticed in several cases where such a liquid has been seen to exude on pressure from the seat of perforation; or, finally, the faecal concretion is discharged into the peritoneum or peri-cæcal abscess, where, if the affection is prolonged, it becomes dissolved and disappears, but where it will be found perfectly recognizable when the opening of the purulent collection is made early. In nine observa-

tions of Roux, of Lausanne, where the presence of a scybalum was noted at the opening of the abscess, in five the concretion was in the cavity of the appendix, while in four it was in the evacuated pus. As for this displacement of the scybalum, it is attested by autopsies which show the foreign body engaged in the opening of the perforation, or completely escaped, and still in contact with the external wall of the appendix.

Another objection may be made, the presence sometimes noted of scybala or foreign bodies in the cavity of an appendix absolutely healthy. The most remarkable case is that of Lewis; at the autopsy of a man aged 88 years, a great lover of game, who, during his life, had never presented any symptom of appendicitis, there was found in the appendix 122 small shot.¹

But this objection is precisely the justification of this theory which we advocate. Foreign bodies, scybala, etc., are incapable of themselves of provoking inflammation of the appendix; as long as they are free in its cavity they are inoffensive. No more in the appendix than in the cæcum, is it likely that the simple contact of fæcal balls can inflame a mucosa made to be in perpetual contact with fæcal matters. In order that an inflammation may be produced, it is necessary that the foreign body should obliterate the duct and compress its walls.

¹ N. Y. Med. Jour., 1856.

10. THE MICROBES AND THEIR ROLE.

In fine, the scybala or roundish concretions which are found in the cavity of the appendix, cannot be regarded as direct causes of irritation or perforation; they are agents of obstruction and of compression.

The mechanism of compression is not just what Dr. Porter, of Boston, thinks it to be. His idea is that the pressure exercised by the foreign body on the vessels of the walls leads to gangrene of these walls; but according to him, perforation takes place at the line of demarcation which separates the sound from the sphacelated parts, *i. e.*, above the concretion.

To this, Roux, of Lausanne, objects that in a good many cases the perforation is below the foreign body. He adopts the view of obstruction. The occlusion of the duct gives rise immediately to a more intense secretion of the mucosa, to an engorgement of the walls whose vessels are compressed at their point of entrance. These walls become rigid, less elastic; they become gangrenous, in whole, or in part, if the calculus is angular or if it compresses largely all the vessels; but the perforation may take place under the action of the pressure of the pent up liquid of the appendix, and is not necessarily limited to the point of strangulation of the calculus, which acts in many cases like a simple plug, less often as the immediate agent of the perforation.¹

¹ Roux, of Lausanne, *Surgical Treatment of Suppurative Perityphlitis*, *Rev. Méd., de la Suisse Romande*, April, 1890.

This hypothesis of the rupture of the appendix by the internal pressure of the liquids does not seem to me to be tenable. The extensibility of the intestinal walls is considerable; there would be needed in order to overcome it an enormous pressure which we cannot reasonably ascribe to the liquid secreted in the appendix; at any rate, if this tension were sufficient to cause rupture of the walls, for a stronger reason it should be sufficient to force back into the cæcum the foreign body and thus clear away the obstruction. If, then, neither compression nor obstruction can of itself explain the ulcerous process or the perforation, we need the intervention of a third factor sufficient to cause the destruction of the anatomical elements of the wall, namely the bacterial proliferation in the interstices of tissues which have lost by suppression of their nutrient blood, a part of their vitality.

This active rôle of microbes I pointed out 10 years ago in my communication to the Anatomical Society. No one to-day contests it. We do not at this day need the aid of culture and other experiments to prove this. It is evident that no specific microbe presides over the perforations of the appendix. We may nevertheless ask if some one of the species which inhabit the surface of the intestinal mucosa does not take a predominant part in the evolution of the lesions.

Unhappily, the microbiology of the intestine is so difficult and obscure, the few notions that we possess

on this subject are still so confused, that we can make no precise affirmation as to the rôle attributable to the different species in the intimate mechanism of appendicitis. Numerous varieties of coccus, of bacilli, of vibriones, without reckoning the fungi of higher order, saccharomycetes, mucedinæ, vegetate, in the normal state, in the intestinal mucus. In certain pathological states, some of these species seem to take on a predominant development which enables us more easily to isolate them by culture. Thus it is that we know the Neapolitan bacillus of Emmerich, found in the cholera epidemic of Naples, the curved bacillus of Finckler and Prior, isolated in cholera nostras, the bacillus of green diarrhœa of Clado and Lesage. But we do not know if these microbes naturally belong to the intestine or if they come from without. We do not know even if they constitute distinct species, as the bacillus of Emmerich does not seem to be other than the *bacterium coli commune*, and there are some that think that the bacterium coli is itself only the attenuated typhoid bacillus. The morphological differences are inappreciable, since the species are themselves polymorphic, and the differences of culture are so slight that scarcely a differential character is attributed to one, before we are obliged to admit that the others possess it also. So in the end what really characterizes them the best is the name of their discoverer and the pathological state where they are ordinarily met.

It is plain that in these conditions it would be useless to try to recognize them in the contents of a normal intestine. There exists, however, a species which seems really autonomous, it is that which Escherich has described under the name of *bacterium coli commune*.

It is a polymorphous bacterium of variable length, mobile, and presenting in its development in divers media such similarities to the typhoid bacillus that Roux and Rodet, of Lyons, see in these two organisms only the same species under different forms with different degrees of virulence.

This bacterium is found in the normal state in the mucus of the large intestine. In four cases of choleric diarrhœa in man, Gilbert and Girode have isolated and collected it, not only from the stools and intestinal liquids but also from the urine, from the pleura, from the lungs, and from the cephalo-rachidian liquids. The same observers, as also Charrin and Roger, have found it in suppurative angiocholitis; Veillon and Jayle have detected it in an abscess of the liver of dysenteric origin. According to these writers, the bacterium coli can then produce not only inflammatory lesions but also suppuration.

It might have been foreseen that the same microbe would be found in the exudation of peritonitis, Laruelle was the first to declare that it is the veritable agent of peritonitis by perforation. He admits, nevertheless, that a prior alteration of the serosa is

necessary whether by contact with the bile, whether by contact with the intestinal liquid, in order that the inflammation may be produced.¹

A. Frankel, in 31 cases of peritonitis, has met the bacterium coli in six, and in two another bacterium described also by Escherich in the stools of new-born infants, the *bacterium lactis aërogenes* which Babin-sky proposes to name *bacterium aceti* by reason of the great quantity of acetic acid which it produces in fermenting the sugar of milk.²

In four cases of peritonitis by perforation, Barbacci found the *bacterium coli* not only in the peritoneal exudation, but also in the blood of the heart and blood vessels.

Dr. William H. Welch has noted the presence of the same microbe in six cases of peritonitis; in four the peritonitis was due to perforation; in two it was consecutive to an intestinal affection without perforation. However, Welch does not seem to be convinced of the phlogogenous action of the *bacterium coli* on the serosa. He says that in intestinal diseases this bacterium has a great tendency to diffusion throughout the organism. In 25 autopsies of persons who had died of intestinal lesions, ulcerations, diphtheritic or hæmorrhagic inflammations, traumatism, he has isolated it in pure cultures from most of the

¹ Laruelle, Bacteriological study of peritonitis by perforation, *La Cellule* 1889, t. v.

² A. Frankel, *Wiener Klin. Woch.*, 1891, Nos. 13 and 15.

viscera; he has hardly ever met it outside the intestine when the mucosa was sound. He does not then think it to be demonstrated that the *bacterium coli* possesses a pathogenic rôle apart from certain special conditions.¹

Lastly, in a recent paper embodying personal research, Malvoz says that in six cases of peritonitis of intestinal origin he has always found the Escherich bacillus in a state of culture almost pure. In one case he had to do with general fibrino-purulent peritonitis consecutive to appendicitis. Malvoz did not determine whether there was perforation. Cultures made with the peritoneal exudate and with the blood of the heart gave the *bacterium coli* to the exclusion of every other microbe.

These facts prove the frequency if not the constancy of the bacterium of Escherich in the exudate of peritonitis of intestinal origin. The observations of Malvoz and Welch show that it is not necessary that there shall be perforation in order that this microbe may penetrate the peritoneum. It seems then that we may conclude that the presence of the *bacterium coli* characterizes these peritonites just as the presence of the streptococcus characterizes puerperal peritonitis.

But is the *coli commune* capable of itself of pro-

¹ Conditions Underlying the Infection of Wounds, Am. Jour. of Med. Sc. Nov. 1891. See also Wurtz and Hermann in *Arch. de Med. Experim* Nov. 1891, and Widal's article on the *bacillus coli* in *Gaz. hebdom. de Med.* Jan. 1892.

voking inflammation of the serosa? The experiments of Laruelle and Frankel seem to indeed establish that peritonitis is not produced after the injection of pure cultures of the microbe, unless one at the same time injects bile or sterilized intestinal liquid. In human pathology these conditions are realized when there is a perforation; the bacteria fall into the peritonæum with the liquid which contains them. But in peritonitis by propagation, how are we to explain the phlogogenous action of the *bacterium coli*? Charrin and Roger nevertheless say that they have caused by intra-peritoneal injections of this microbe, hemorrhagic peritonitis which killed the guinea pigs in 15 days. Widal says also that by inoculating in the peritonæum of guinea pigs minimum quantities of fresh cultures, he has induced fibrinous peritonitis with a fall of temperature and rapid death of the animals. New researches evidently are necessary to establish definitely the mode of reaction of the peritonæum in presence of the *coli commune*.

Is this microbe now the sole cause? In two cases of peritonitis consecutive to tuberculous ulcerations of the intestine, Frankel has found the streptococcus pyogenes; in two other cases, of intestinal origin, he has isolated the *bacterium lactis aërogenes*; lastly in one case there existed several microbic species associated. In a case of perforative appendicitis, Welch says that streptococcus pyogenes seemed to be the only organism present in the peritoneal exudate. It

is probable that more minute researches will reveal other varieties of micro organisms.

We do not, then, feel justified in regarding the *bacterium coli* as the sole pathogenic agent of the peri appendicular lesions. It characterizes by its presence the exudate of appendicular peritonitis; but it is probable that other intestinal microbes may be associated with it, as the golden staphylococcus, entering with the food and escaping the action of the gastric juice, and it may be that in certain cases some one of these may take the ascendancy, and by its predominant proliferation modify the aspect and the consequences of the intestinal perforation.

11. LESIONS OF THE WALLS OF THE APPENDIX.

This pathogenic rôle of foreign bodies and of microbes enables us to interpret not only the grave forms of appendicitis with gangrene and perforation, but the milder forms as well.

It is evident that the foreign body may be more or less voluminous and the canal more or less narrow. The degree of constriction exercised on the vessels of the walls will vary, then, according to these two conditions, and consequently the circulation will be simply impeded or retarded, rather than obstructed; hence there will be degrees also in the damage done to the vitality of the walls.

On the other hand, the liquid imprisoned in the appendix may be more or less rich in microbes, and

more or less favorable to their development. Doubtless, also, we must take account of the kinds of bacteria found in the appendix at the moment of the obstruction, of their pathogenic power and degree of virulence.

Lastly, the foreign body may become displaced; it may fall back into the cæcum, whether by reason of peristaltic contractions of the muscular coats of the appendix and large intestine, or from softening of the periphery of the scybalum in contact with the secretions of the duct.

These alternatives explain the variable intensity of the inflammatory process, which may be limited to simple exudative inflammation of the walls, an inflammation that may be propagated to the external cellular and peritoneal coats, and which may finally end in limited perforation or total gangrene of the appendix.

These are not theoretical lesions like those of the classics typhlitis; they are lesions which have been seen and noted many times. The post-mortem examination gives only the grave lesions of perforative appendicitis, but the daring laparotomies of the American surgeons have enabled us, so to speak, to watch the successive stages in the living subject, and to follow all the other phases and modalities which do not ordinarily end fatally. It is on the numerous observations published the last five or six years in England and especially in America, that the following description is based.

From an anatomico-pathological point of view, we may admit three principal varieties of appendicitis; simple appendicitis acute or chronic, suppurative appendicitis, and gangrenous appendicitis.

a. Simple inflammatory lesions.—These correspond to what the Americans call acute or chronic catarrhal appendicitis. This term is, in my judgment, improper, in that it seems to indicate a superficial phlegmasia limited to the mucosa, when in reality all the coats are affected. It is theoretically possible that in the mildest cases, in appendicular colic of very short duration, the lesions may be limited to a temporary irritation of the mucosa, but this can neither be affirmed nor verified, as the accidents all appear and disappear in 24 hours. The name of *parietal appendicitis* seems to me to be preferable.

The earliest operations practiced for appendicitis occurring in a light form, have been made on the second or third day after the onset of the disease. Already at this period there exists a roughness, a want of polish of the serosa, and soft adhesions between the appendix and surrounding parts. The inflammation starting in the mucosa spreads with great rapidity through all the coats of the appendix, and reaches the peritoneal coat in 48 hours. This is the important fact to remember.

The appendix is augmented in volume; it appears dilated, turgescient as in erection, and is as large as the little or index finger, its walls are thickened, its cavity

is enlarged and filled with a viscous or semi-purulent mucus.

The microscopical examination shows the vessels of the mucosa and submucosa to be dilated and engorged with red blood globules; the cul-de-sac of the tubular glands filled with large cells; the interstitial tissue filled with embryonal cells. This infiltration is continued between the fibres of the muscular layer; it then spreads to the sub-serous coat under a diffuse form or by little masses of round nuclei. The endothelial cells of the serosa are in part desquamated or, it may be, augmented in volume, containing vacuoles or granulations.

Such lesions may surely end in resolution without leaving any traces, as those cases seem to indicate which get well by simple medical treatment. They may also be the first phase of the process of suppuration to which we shall return presently. Lastly, without completely resolving, they may pursue a chronic course.

With regard to this chronic evolution, is it always consecutive to an acute attack? May it not be chronic from the first? This is probable, and in such cases we may ask if the appendicitis is not an episode of a chronic lesion of the large intestine, and if the catarrh of the mucous membrane of the colon has not been propagated to that of the appendix? This is an etiological question which awaits discussion.

However this may be, the simple chronic appendicitis which oftenest forms the anatomical substratum of the clinical variety called *relapsing appendicitis*, or at least which often constitutes the sole lesion on excision of the appendix in the interval of two attacks, presents itself under divers aspects.

In general, the appendix is augmented in volume; its external surface is rugous; its walls are indurated and hypertrophied; it is adherent by some point to neighboring coils of intestines, to the abdominal wall, or to the omentum; sometimes it is imbedded in a mass of fibrous tissue and difficult to detach. The cavity is dilated and contains several drops of thick mucus. The mucosa appears smooth and healthy.

In two cases reported by Porter,¹ the microscopic examination showed no alteration of the mucous membrane, the chronic inflammation occupied exclusively the submucosa, the muscular and peritoneal coats.

Apart from a certain degree of dilatation, the cavity of the appendix may then be normal. At other times, it presents partial contractions with dilatations above and below, sometimes even a complete obliteration which divides the canal into two, the free extremity being then extremely thickened, dilated and distended by mucus. Lastly, the obliteration may be total, the appendix being reduced to a hard, fibrous cord, lost in the midst of fibrous adhesions.

¹ Porter. Boston Medical and Surgical Journal, Dec. 25, 1890.

b. Suppurative lesions.—The liquid contained in the inflamed duct is almost always purulent; in sub-acute appendicitis, if the upper orifice is obstructed, there will be a little purulent collection pent up in the cavity. The true, suppurative appendicitis is where the parietal inflammation determines the formation of little masses of pus between the coats of the appendix. Ordinarily, when the surgeon operates, he finds the appendix in its entirety infiltrated with pus and generally perforated.

c. Gangrenous lesions.—These are the most important and the most common. The greater the constriction exercised by the foreign body, and the nearer this is to the base of the appendix, the more rapid and complete the necrosis. In a case reported by Dalton, of St. Louis, the operation performed just 24 hours after the onset of the attack, showed the appendix to be of a dark blue color, almost black, largely distended, and as large as the little finger, There was even then no inflammation in the vicinity; the appendix was not perforated; in its cavity was found a large and very hard concretion.

The circulatory strangulation has then for its first effect venous stasis with œdematous infiltration of the walls. The two grave consequences of this first phase are limited perforation, or total sloughing of the appendix.

In both cases the process is the same; partial, when the perforation is limited, general and circulatory

when the appendix is detached in its totality. The gangrene is a moist gangrene, a destruction by microorganisms of the elements of the walls deprived of their vitality.

Sometimes the perforation is single; sometimes there are one or several points of perforation, sometimes the orifice is very small, difficult to find and scarcely visible; habitually it is clean cut, round, of the size of a hemp seed or of a pea.

The seat of these perforations is never or scarcely ever in direct relation with the foreign body imprisoned in the appendix; ordinarily, it is some little distance above or below the concretion, very often near the point of the appendix. The perforation is simply in relation with the degree of vital resistance of the wall, and takes place just where this wall yields most rapidly to the destructive action of the microbes. Generally, an acute general peritonitis follows the perforation, carrying off the patient in a few days. But if the peritonitis is limited, the process of gangrenous ulceration has time to go on, the destructive action may involve the entire circumference of the appendix, which becomes detached in its entirety and falls into the pus cavity; this is total necrotic amputation.

The appendix is then found in the purulent focus in the midst of pus and false membranes, sometimes easy to detect, under the form of a cylinder more or less long, of greenish gray or blackish color, infil-

ated with purulent liquid, sometimes unrecognizable and confounded with pseudo-membranous shreds and the debris of the sphacelated connective tissue.

12. PERI-APPENDICULAR LESIONS.

The appendix cannot be seriously affected, as has been seen, without rapid diffusion of the inflammation through the various coats till the external coat is reached. There is no appendicitis without more or less of peri-appendicitis, but the gravity and the extension of the peri-appendicitis-lesions are themselves variable, as the intensity of the parietal lesions.

It is important first to determine the habitual seat of these lesions. The old pathologists saw only lesions of the sub-peritoneal connective tissue, while most surgeons at the present day think that the connective tissue is only exceptionally involved, the almost constant peri-appendicular affection being peritoneal inflammation.

An absolute affirmation is no more permissible in the one case than in the other. It cannot be denied that the sub-peritoneal cellular tissue may be invaded, at least secondarily to the peritonitis, in those prolonged cases where all the tissues of the iliac fossa down to the bone are found infiltrated with a purulent and sanious *bouillie*.

But direct inflammation is also possible. Anatomical investigations show that out of 200 cases, in 123 the appendix is free in the peritoneal cavity, but in

77 it is in intimate relation with the subperitoneal tissue (Ferguson). It must then be admitted that if appendicitis were to supervene in one of these 77 cases, the peri-appendicitis would be not a peritonitis but a phlegmon. It may then well be believed that in a certain number of cases the inflammation primarily affects the retroperitoneal connective tissue. At the same time such cases are admittedly exceptional. Their possibility however must be kept in mind. The statistics given by writers certainly do not prove the constancy of peritonitis, whether encysted or limited. In 100 autopsies, were found 85 peritonites, four extra peritoneal abscesses, and 11 complex cases. Maurin in 94 cases of fatal appendicitis, found 80 peritonites, five extra peritoneal abscesses, and nine cases where there was at the same time abscess and peritonitis. Even in the fatal cases, the abscess may then exist alone in the proportion of five per cent., but naturally the fatal cases are for the most part due to a peritoneal perforation. In cases which have recovered, however large may be the part which we assign to encysted peritonitis, is it not right to suppose that for a certain number the inflammation is localized in the cellular tissue?

We admit then the possibility of *peri-appendicitis of the cellular tissue* which may sometimes end in resolution, but may also become the origin of a pericæcal abscess. But this being granted, we must recognize two things: 1. That pathological anatomy

is incapable of describing the first phases of this type; 2. That peritoneal lesions of whatever nature are incontestably more frequent.

These lesions may be simply plastic—*fibrinous* or *adhesive peritonitis*; or fibrino-purulent, *suppurative peritonitis*; or sero-purulent sero-sanguinolent, with fetid odor, *septic peritonitis*. They may be diffuse and general, or partial, limited, and encysted. Lastly, they may be produced by propagation by continuity and contiguity through the walls of the appendix, *progressive peritonitis*, or by rupture of the diverticulum, *peritonitis by perforation*.

a. Partial fibrino-plastic peritonitis.—When the lesions are limited to a fibrinous exudation, the peritonitis is always progressive; the peritoneal inflammation takes place in contact with the appendix, just as fibrinous pleurisy in contact with a focus of pneumonia. The fibrinous peritonitis belongs to simple appendicitis or at least to the first phases of the appendicitis as long as perforation does not take place. It may be sufficiently marked at the end of 36 to 48 hours to produce adhesions between the appendix and the neighboring parts, and to glue together coils of the intestines. This first outbreak of peritonitis may be more beneficial than injurious; it has no tendency to spread far, and in provoking the formation of adhesions, it limits the consequences of the perforation; if the latter takes place, it prevents the escape of irritant matters into the abdomen;

the suppuration remains encysted in the space circumscribed by the plastic exudation.

But the perforation may not take place. What then becomes of this partial peritonitis? Does it remain fibrino-serous, or may it suppurate? I am led to believe that suppuration does not take place unless the appendix is perforated. It is not however impossible that the pyogenic microbes may under some circumstances, as an event of their proliferation, pass through the walls of the duct without causing ulceration. This is however still a matter of hypothesis.

The rule is that the peritonitis remains fibrino-serous if the appendix is not perforative. You will find, on opening the abdomen, coils of intestines agglutinated, matted together, by a fibrinous reticulum containing in its meshes an opaque serosity of fetid odor. It would be interesting to make the microbiological examination of this liquid, and to determine the species of microbes, if any, that are found there, and whether in fact the effusion is in direct relation with the presence or absence of micro-organisms. A few years ago we should not have hesitated to affirm that the absence of two pyogenic microbes, the staphylococcus aureus, and the streptococcus-pyogenes, would explain the non-suppuration of the exudation. To-day, most of the pathogenic microbes seem capable of producing pus; we do not know exactly what suppuration is, and we should be chary of hypotheses.

What is certain, is the persistence in the fibrinous state of the encysted exudate. And what from a practical point should be remembered, is that this local fibrinous peritonitis gives rise to the same physical signs of puffiness, tumefaction, and dullness, as a purulent collection.

The surgeon finds here a new reason for hesitation when deliberating about an operation. For there is no doubt that this fibrinous exudate may resolve and be absorbed like every other exudate of the same nature, pleuritic or pericardiac, and that this resorption explains the great number of perityphlites cured medically without the aid of the surgeon.

Another consequence attending this peri-appendicular peritonitis, is the fixation of the point of the appendix in a position and in regions absolutely abnormal. When it is free in the abdomen, the initial inflammatory attack may fix it and make it adhere in points where we should not expect to find it, the rectum, the bladder or the vagina. The appendix has even been found in the scrotum in a hernial sac, or fastened to the anterior wall of the abdomen near the umbilicus. If perforation takes place under such conditions, the seat of the encysted peritonitis will not be the iliac fossa where it is ordinarily located, and you can see how difficult it would be to diagnose an appendicitis when you have a fluctuating tumor of the scrotal or umbilical region.

b. Encysted purulent peritonitis.—This is the ordi-

nary anatomical form of perityphlitis, of the pericæcal abscess; it is the most common consequence of perforative appendicitis, on condition that the initial peritonitis has had the time to form protective adhesions, or that these adhesions existed previously, the remains of a former appendicitis. It is on the position of the appendix in the abdomen that the seat of the purulent collection depends.

c. General peritonitis.—If previous adhesions do not exist or if the adhesions are not sufficiently resistant, if the perforation takes place rapidly in the first 48 to 72 hours, the peritonitis is general *from the first*. But a diffuse inflammation of the peritonæum may come on later and be *secondary*. The perforation will first give rise to an encysted collection, then at the end of a variable time, whether by rupture of the sac or by propagation of lesions at first localized, the inflammation becomes generalized to the whole serosa.

The morbid changes are the same in both cases: agglutination of the intestinal coils, which are covered with vascular purplish arborizations; false membranes accumulated in certain points, most abundant in the right iliac fossa, fibrinous or infiltrated with pus; a turbid, more or less opaque liquid containing fibrino-purulent flakes, having a special fetid odor, sometimes a frank stercoral odor; in some cases the presence of gas in the abdominal cavity.

I shall not return to what I have said concerning

microbes found in such cases in the exudate. The presence of the *bacterium coli* is probably constant, but is this bacterium the true cause of the peritoneal inflammation? As it is associated with several other varieties, what is the part which belongs to it, both in the septic and phlegmasic accidents? It is probable that the lesions are not absolutely identical in all cases, and that the quality of the exudation differs according to the bacterial species whose development predominates. It is certain that the abundant formation of liquid pus which results from the presence of the puerperal streptococcus in the peritoneum of lying-in-women is not observed in peritonitis by perforation of the appendix; but perhaps, also, it is only a question of duration, the peritonitis by perforation killing much more rapidly than puerperal peritonitis.

However this may be, the facts show that certain peritonites by perforation are surely rather septic than inflammatory. They cause death much more promptly in three or four days, with the symptoms of septicæmia, of adynamia, without marked febrile reaction. The exudation in these cases is turbid, sero-sanguinolent, with disagreeable odor, rather than frankly purulent. Perhaps these septic peritonites are more especially in relation with the *bacterium coli*, and there may be associated with it some of the vibriones which are met with on the surface of the intestinal mucosa.

13. THE PERITYPHLITIC ABSCESS.

The purulent collection consecutive to perforation of the appendix is generally, as we have said, *intra-peritoneal*. But in a certain number of cases it may be *sub peritoneal*, occupying the retro cæcal and iliac cellular tissue. This is what the old writers called abscess of the iliac fossa. It is to-day, however, indisputable that the extra-peritoneal seat of supplicative perityphlitis, which they regarded as most common, is the most rare.

The contents of the purulent sac would suffice of themselves to demonstrate the peritoneal origin of the pus. It is, in fact, exceptional to find the pus thick, of good consistence, like the pus of a phlegmonous abscess of the cellular tissue. It is ordinarily thin, turbid, opaque or greenish, full of flakes or of debris of false membranes, being a purulent serosity rather than true pus.

This liquid has a fetid, sometimes fæcal, sometimes almost gangrenous odor, which may infect the room during the operation. The presence of gas in the purulent sac is frequent. In this pus may be found fragments of fæcal matters hard or soft, little roundish scybala from the perforated appendix.

The limits and dimensions of the purulent collection are very variable. From a tumor as large as the fist limited to a point of the iliac fossa, to the diffuse and gangrenous infiltration of all the poster-

ior abdominal region, we may observe all degrees. In explanation of this fact, we must take account of the duration of the disease, and distinguish between the results furnished by the post mortem examination when the course of the abscess has been left to itself, and cases where the bistoury has stopped the extension of the lesions, and where the autopsy is, so to speak, surgical.

In cases of the first kind, the opening of the cadaver will show the extreme alterations described by Grisolle in phlegmonous tumors of the iliac fossa. In cases of the second kind, the size and the seat of the purulent collection will present notable differences. These differences of location are determined by the variable position which the appendix occupies in the abdominal cavity.

Sometimes, the appendix takes a downward direction, and its perforation will give rise to a purulent collection in the inferior part of the iliac fossa; the pus will accumulate above Poupart's ligament; the abscess will be intra-peritoneal or sub-peritoneal or both, according as the appendix is free, or according as it is fixed by its mesentery to the iliac fossa; the perforation takes place between the folds of this mesentery, in the cellular tissue communicating with the sub-peritoneal tissue. In these conditions, the abscess will point in the groin, and if left to burst, may leave at this point a fistula which may persist for months and even years. Fitz has seen a patient

in whom a fistula of this kind had lasted more than 19 months.

2. Sometimes the appendix is directed inwardly and engages in the pelvis, and comes into relation with the anterior aspect of the rectum. In cases of this kind, the peritonitis becomes encysted in the internal part of the iliac fossa, and the pus tends to accumulate in the pelvis between the rectum and the bladder, or the vagina, in the female. By the rectal and vaginal touch, the purulent sac can be detected at this point. A spontaneous opening may take place in such cases, generally into the rectum, sometimes into the vagina or bladder.

3. Sometimes the appendix is inflected inwardly and anteriorly, being applied to the internal aspect of the cæcum. In such cases, the pus may collect above and within the iliac fossa, and even point in the neighborhood of the umbilicus. It is probable that the cases of encysted suppurative peritonitis described in the infant as of spontaneous origin, and getting well after evacuation of the pus by the umbilicus, are only cases of appendicitis belonging to this third variety.

4. Lastly the appendix may be situated behind the cæcum glued to its wall, or embedded in the cellular tissue of the retrocæcal region. In cases of this kind, the pus will collect around the cæcum and point in the costo-iliac space, or in the lumbar region above the crest of the ilium. Whether it be at first

extra or intra peritoneal is of little consequence in such a case; the abscess behaves as if it were confined to the cellular tissue, isolation from the great peritoneal cavity being easily effected in this region. Limited in front by the large intestine, behind and at the side by the lateral and posterior wall of the abdomen, the abscess, by reason of the thickness of the muscular layers which it would have to perforate, has little tendency to burst externally. Either it burrows downwards in the iliac fossa, or it extends upwards and may come into relation with the inferior surface of the liver, perforate the diaphragm and determine a purulent pleurisy, or even open into the cæcum or colon. A large number of the cases reported as examples of primary ulcerous typhlitis determining a suppurative perityphlitis by perforation of the cæcum, are cases of inflammation of the appendix, thus deviated backwards, or outwards; the perforation of the walls of the cæcum is the consequence and not the cause of the perityphlitic abscess.

Such are the four principal types of localization of purulent collections consecutive to perforation of the appendix. Moreover, the sac is not always single, the peritonitis often walls in two or three spaces in the midst of false membranes, and these spaces form distinct pockets of pus.

Besides the four principal localizations, iliac, pre-rectal, umbilical and lumbar, the peri-appendicular collection may gain regions where one would never

have thought of looking to the appendix for the origin of the abscess. Thus, an appendix has been known to be inflamed and perforated in a hernial sac (Shaw). Another rare variety is *scrotal appendicitis* (Thurman, Monks).

When the abscess does not open either externally or internally; when surgical interference is not sought, or is sought too late; when, in a word, the patients succumb to exhaustion and septicæmia, there are found at the autopsy lesions which are sometimes extremely diffuse.

Besides the abscess, more or less well localized, with blackish, irregular walls, forming the principal *foyer*, and containing a pus which is stercoral, fetid, gangrenous, we habitually note, on the one hand a peritonitis which is generalized and fibrino-purulent, and on the other an infiltration, more or less extensive, of the cellular tissue and of the muscles of the retro-peritoneal region. The psoas, iliacus, and quadratus lumborum have their fibres blackened, softened, and in part destroyed, dissected out by the putrid pus. Observers have seen at the end of three weeks, the peritoneum which lines the iliac fossa as well as the iliac fascia perforated and destroyed by the gangrene, and the entire psoas muscle infiltrated with pus and sphacelated.

Among the rare complications are: *a*, thrombosis of the iliac vein with œdema of the corresponding inferior member; *b*, a mortal hemorrhage may result

from ulceration of one of the arteries of the region; *c*, *pylephlebitis* is still one of the possible consequences of peri-appendicular abscess. Of the latter, Fitz has collected 11 cases out of a total of 257.

This pylephlebitis may give rise to accidents which change completely the aspect of the disease, and in the midst of which the appendicitis disappears forgotten and misunderstood. From the thrombosed mesenteric veins suppurative emboli are carried to the liver where they give rise to abscesses more or less formidable. Gendron has reported three cases of the kind where a voluminous hepatic abscess, consecutive to a pylephlebitis of appendicular origin, perforated the diaphragm, produced a pericarditis and a purulent pleurisy, which itself terminated by a vomica which opened into the bronchi.¹

¹ Vide Powell, New Orleans Med. and Surg. Jour., 1855, xi., 168.—
Barlow, Lancet, 1853.

Gendron. A Study of Suppurative Pylephlebitis. (Thèse de Paris 1883).

III.

THE CAUSES.

Pathological anatomy shows that in the immense majority of cases the true cause of the appendicitis, as far as being an isolated and independent affection, is the presence of a foreign body in the cavity of that organ. When the foreign body comes from without, a pin, a fish bone, a seed, a cherry stone, the etiology limits itself to noting that fact; the appendicitis is a simple accidental traumatic lesion. When the foreign body is from within, a *scybalous concretion* (stercoral appendicitis) we may undertake to investigate the conditions which put in operation this essential cause. We have then to study: 1, the causes which favor the formation of scybala; 2, the causes which determine its penetration in the appendix and provoke the accidents.

14. PREDISPOSING CAUSES.

It is not easy to determine in what circumstances and under what influences scybala are formed. We must include under this head not only the causes which favor the formation of fæcal concretions, but also, in a general way, the conditions in which appendicitis is generally observed.

1. *Atony of the large intestine.*—The most common cause alleged by writers is constipation. At

the same time, in 209 cases published under the name of typhlitis and peri-typhlitis and analyzed by Reginald Fitz, we find constipation 38 times mentioned in the antecedents of the patient, and in only 15 out of 257 cases of fatal perforative appendicitis was this fact indicated. This really gives little justification for the unanimity of the authorities in regarding constipation as the predisposing cause of the affections.

It is a little singular that constipation is so frequent in women, and at the same time appendicitis is four times more frequent in man than in woman; on the other hand, constipation is the rule in old people, and all the statistics show that appendicitis is very rare after the age of 40.

Moreover, the statistics of Fitz show that out of 466 cases, in 26 the subjects were affected by diarrhœa.

It will hardly do, then, to say that either constipation or diarrhœa favors the development of appendicitis. Constipation and diarrhœa are of particular nature; they are the possible, though not certain effects of a functional trouble of the large intestine connected with those badly defined states called intestinal-atony, membranous-colitis, mucous-colitis. This bad functioning of the large intestine, characterized both by defective secretion of the mucosa and by irregular, sluggish or unequal contraction of the muscular coat, manifests itself rather by dull pains in the belly, by abnormal tension of the abdomen, by

irregular stools, sometimes glairy, sometimes dry, than by a constipation or diarrhœa properly so-called.

I believe that this chronic colitis is the most ordinary cause of fœcal concretions. Matters fœcal or mucoid of bad consistence are deposited in little masses in the culs-de-sacs and herniæ of the mucosa, become dried there and concreted in the form of little balls by the mechanism which I have indicated above.

It may be objected that the recorded observations do not mention these intestinal troubles. But why be astonished at this? These troubles are too little marked ordinarily to be regarded as a disease, and the subject hardly thinks of consulting a physician about them, except when they end in a real and obstinate constipation, or severe attack of diarrhœa.

It will also be objected that the autopsy ordinarily shows integrity of the mucous membrane of the large intestine. But we have to do with superficial, catarrhal lesions, which no more leave appreciable traces to the naked eye than a simple bronchitis or a coryza.

These attenuated forms of glairy colitis are not rare in young people, they are especially observed in childhood, and are well known to the physicians of childrens' hospitals. In a recent work, Jules Simon has not failed to call attention to these preparatory intestinal troubles, and to indicate their rôle in the etiology of appendicitis in early life.¹

¹ Jules Simon, *Rev. des mal de l'Enfance*, Oct. 1891.

2. *Diet and previous diseases.*—It is by the intermediation of this atonic-colitis that is explained the influence of diet or of previous diseases in the development of appendicitis. Great eaters are predisposed to this affection; likewise undigestible, or too highly seasoned, or too nitrogenous a diet. But these dietetic vices are the most ordinary causes of chronic irritation of the large intestine.

As for previous diseases, typhoid fever, eruptive fevers, dysentery, which are regarded as favoring appendicitis, their rôle ought to be interpreted by the lesions which they have left after them on the mucosa of the colon, lesions which keep up the tendency to atonic distension of the intestine and chronic inflammation of the mucosa.

For a stronger reason, we may ascribe to such chronic inflammations, the cicatricial results of old lesions of the intestines, bands, puckerings, and in particular, a certain rigidity of the ileo-cæcal valve deformed by adhesions which Bamberger has pointed out as an important predisposing cause, and of which Gambetta's case furnishes a remarkable example.¹

All these causes act in the same way by hindering the mechanism of the contractions of the large intestine, and by determining the formation of depressions and herniæ of the coats and the accumulation there of debris of fæcal matters the origin of the scybala.

¹ Bamberger, *Handb. der Spec. Path. und Ther.* Erlangen 1864. See also the account of Gambetta's disease in *Gaz. hebdom.*, Jan. 19th, 1883.

We must assign a place apart to tuberculosis among the causes of appendicitis; but the tuberculous form is a special specific appendicitis, absolutely different in its lesions, as in its evolution, from ordinary appendicitis. Tuberculous appendicitis is only a particular case of tuberculosis of the intestine. We know how frequent are bacillary ulcerations of the large intestine; the cæcum is one of their places of election. The cæcal ulcerations may spread to the mucosa of the appendix, or they may originate there. If the ulcer extends deeply, it determines a chronic inflammation around the ulcerated organ, and sometimes even a veritable tuberculous peritonitis localized and suppurative. The affection well merits the name of *tuberculous typhlitis*, for the cæcum is the starting point and the principal seat of the alterations. But the appendix may be attacked predominantly, and in some cases (probably very rare), the consequences are the same as those of acute perforating appendicitis. Dufour has reported an instance of tuberculous perforation of the appendix which was followed by general peritonitis, rapidly fatal. But, as a rule, tuberculous typhlo-appendicitis constitutes a clinical species apart, distinct from ordinary appendicitis, and which we shall have to concern ourselves about only when it is a question of diagnosis.

3. *Convalescence from acute diseases.*—Appendicitis sometimes comes on in ordinary convalescence from acute diseases; it has been noted as a sequel of typhoid

fever. I have seen it in an aged woman in a convalescence from pneumonia. I do not believe in the direct influence of acute disease on the development of appendicitis, but in a simple predisposing action. A traumatism, a fracture, a wound, may have the same consequences in condemning the injured person to rest and to prolonged immobility, contrary to his habits.

In these conditions the atony of the large intestines is the rule, and the derangement of the functions of the intestines provokes digestive troubles, or compels resort to repeated purgatives which are the true cause of the appendicitis. Perhaps also the relaxation of the walls of the appendix favors, in a certain measure, the penetration of faecal concretions.

4. *Relapses.*—The existence of a previous attack of appendicitis is one of the most conspicuous predisposing causes. One cannot but think either that the foreign body remains imprisoned in the appendix, constituting by its presence an inflammatory thorn always ready to provoke new accidents; or, that, although the scybalous concretion may have been displaced, the lesions determined by the first attack persist in a sub-acute state, being awakened from time to time under the action of one of the determining causes of which we are about to speak; or lastly, that the passage of the foreign body leaves the canal dilated and enlarged, and that this

enlargement facilitates the entrance of new concretions.

5. *Age.*—The frequency of appendicitis in early life is so great that we are warranted in making of age one of the predisposing causes of the affection. All statistics agree on this point.

The oldest statistics, Bamberger's, pertain to 73 cases, with the following figures:

Below 2 years.....	2 cases.
From 15 to 20 years.....	20 “
“ 20 to 30 “	32 “
“ 30 to 40 “	9 “
“ 40 to 50 “	5 “
Above 50 years	5 “

Paulier, in 49 cases, found 31 from 10 to 30 years ; Maurin, in 69, reckons 54 cases between 10 and 25 years.

The most extensive statistics are those of Reginald Fitz. In 228 cases of appendicitis, he gives the following proportions :

From 20 months to 10 years...	22 cases...	10 per cent.
“ 10 “ “ 20 “ ...	86 “ ...	38 “ “
“ 20 years “ 30 “ ...	65 “ ...	28 “ “
“ 30 “ “ 40 “ ...	34 “ ...	15 “ “
“ 40 “ “ 50 “ ...	8 “ ...	3 “ “
“ 50 “ “ 60 “ ...	11 “ ...	5 “ “
“ 60 “ “ 70 “ ...	1 “	
“ 70 “ “ 80 “ ...	1 “	

It will be seen that the statistics of Fitz give almost the same proportion of cases of appendicitis

occurring below 30 years, as those of Bamberger, 76 per cent. instead of 72 per cent. Between 30 and 40 years the figure falls to 15 per cent. Beyond 40 the affection may be considered as rare. The maximum frequency appears to be between the ages of 10 and 20 years, i. e., during adolescence.

In infancy, appendicitis is rare. This statement is true for early infancy, but not for early childhood. The statistics of Fitz indicate a proportion of 10 per cent. for young children. As a result of the observation of 72 cases of appendicitis in children, Matterstock gives the following figures.

From 2 to 5 years.....	10 cases.
“ 5 to 10 “	25 “
“ 10 to 15 “	35 “
Under 2 years.....	2 “

Why is appendicitis so disproportionately frequent in adolescence and in the adult? It is difficult to give a precise answer to this question. We may suppose that young people are more accustomed to imprudencies in diet, to violent fatigues, to chillings, and all conditions whose occasional rôle of causation is indicated in the observations.

6. *Sex.*—There is general agreement as to the frequency of appendicitis in the male sex.

Bamberger.....	in 75 cases	finds 54 men.	19 women.
Volz.....	in 56 “	“ “ 37 “	9 “
Marchal, de Calvi	in 36 “	“ “ 32 “	4 “
Paulier.....	in 49 “	“ “ 36 “	15 “
Maurin.....	in 94 “	“ “ 78 “	16 “

In adding these various statistics we find the proportion of 79 per cent. for men and 21 per cent. for women.

The elaborate statistics of Reginald Fitz give exactly the same proportion. Out of 247 cases of appendicitis there were 197 males, i. e., 80 per cent., and 50 females, i. e., 20 per cent. The statistics of Pravaz, of Lyons, give the proportion of 25 per cent. of females and 75 per cent. of males.

We may then conclude that appendicitis is more frequent in the male than in the female in the proportion of 4 to 1. As for the cause of this predilection for the male sex, we can but repeat what we have said with reference to age. But here also the fact does not bear any relation to the rôle attributed by tradition to habits of constipation.

7. *Local anatomical conditions.*—It has been supposed that the disposition of the cæcum and its appendix was a predisposing cause. It has been said that the cæcum plays a special rôle in intestinal digestion ; that its *cul-de-sac* form is an obstacle to the progression of fæcal matters and favors their stagnation ; a certain importance has also been attributed to the length of the appendix, and to the presence or absence of the valve of Gehrlach. These are pure hypotheses. The cæcum has no digestive functions ; and it is not proved that fæcal matters accumulate there in the normal state, for it is almost always found empty in the cadaver. As for the dimensions

of the appendix, autopsies have not proved that the perforated appendices have an exaggerated length. It is possible that the absence of the ileo-cæcal valve favors the penetration of scybala; but as it equally favors their expulsion, we cannot make much account of this hypothesis.

To sum up, as predisposing conditions, the two facts which stand out the most clearly from the study of the observations, are the influence of age and of sex. But these conditions act chiefly by favoring the action of the occasional causes. As for the formation of scybala, this seems to be especially in relation with functional troubles of the large intestine, which troubles are the resultant of old lesions, or of a state of sub-acute irritation of the mucosa. But if in these cases it is possible to refer the appendicitis to a chronic alteration of the intestine, we cannot overlook the fact that in a great number of subjects it appears as a simple accidental lesion independent of every other disease, impossible, hence, to foresee or to prevent.

15. OCCASIONAL CAUSES.

We understand by occasional causes all the causes which determine the penetration of a foreign body in the appendix. These causes all act apparently by the same mechanism, in provoking an irregular contraction, more or less sudden, of the muscular coat of the cæcum, a contraction which has for effect to keep open or enlarge the orifice of the appendix, at

the same time that it engages the faecal concretion there.

a. Indigestion.—Indigestion, or at least the ingestion of indigestible aliments, is so often mentioned as the starting point of the accidents, that it is impossible not to regard this circumstance as a frequent determining cause. This is so true that many cases of appendicitis are first diagnosticated even in the fatal forms as simple indigestion.

I do not mean that the vomitings of the onset are the consequence of an indigestion. I am convinced that they are almost always due to a reflex abdominal irritation starting from the appendix. But the passage into the intestine of aliments taken in excess, badly digested or badly tolerated, such as cabbage, mushrooms, carrots, turnips, game too high, etc., provokes abnormal movements of the digestive canal which determine the engagement of the stercoral calculus in the appendix.

Purgatives act in the same way, probably, in cases where the onset of the affection is attributed to them.

b. Exposure to cold and getting chilled.—This common cause of almost all diseases has also been mentioned among the causes of appendicitis. The occasional rôle of chilling does not seem to be disputed. It is of common observation that a sudden exposure to cold, or even getting the feet cold, will cause attacks of abdominal colic in certain predisposed persons. On the other hand, the experiments

of Rossbach on a woman whose abdominal walls presented such a thinness that one could easily detect through the skin the movements of the intestine, prove that a slight degree of cold, such as the simple exposure of the abdomen to the air, produces a lively movement of peristalsis at the end of a few minutes, or augments the force of the contractions if they already exist. It is, then, right to include chilling among the causes which, in stimulating the intestinal contractions, favor the displacement and engagement of the fæcal bolus in the appendix.

c. Traumatism.—Traumatism is an occasional cause quite frequently mentioned. The statistics of Fitz give this cause in 10 per cent. of the cases. We must understand by traumatism not only a blow on the abdomen, a fall, but also every violent effort, such as lifting a weight, dancing, leaping, gymnastic exercise, forced marching. It is not rare to see this cause associated with digestive troubles. Thus we find in a certain number of cases the onset of the appendicitis coincident with a fatigue, or violent exercise, during the first hours of digestion.

These divers causes being recorded, it must be added that it is by no means possible always to find them in interrogating the patients. In perhaps half the cases the etiology remains *nil*. In particular, in that fulminant form which we call hyper-acute perforating appendicitis, the appendicitis manifests itself suddenly in a robust and healthy subject, without anything to explain the explosion of the accidents.

IV.

THE SYMPTOMS.

The ordinary clinical type of appendicitis is quite as simple as that of acute fibrinous pneumonia. A young man, or an adult still young, of habitually good health, or suffering for some time from vague digestive troubles, is suddenly taken with a severe pain in the right iliac fossa. This pain is accompanied with colicky paroxysms more or less violent, followed or not by one or two attacks of vomiting of food or bile. Then the colics subside, but the fixed pain continues, sometimes exactly limited to a point of the iliac fossa, sometimes more diffuse. The muscles of the region are hard and tense, preventing all deep exploration ; the fever is in general of little intensity.

The symptoms may be limited to this, and at the end of seven or eight days the tension and the iliac pain diminish gradually. But in other cases, to the first attack of pain succeeds more or less rapidly, sometimes at the end of 24 to 48 hours, sometimes still later, a new crisis of generalized abdominal pains with incessant vomiting of bilious or porraceous matters ; the belly becomes hard, tense and sensitive throughout its whole extent with predominance of the morbid signs on the right side ; the face becomes pinched, the extremities cold, and the patient succumbs with all the symptoms of diffuse peritonitis.

At other times the pain, which at first spread over the whole abdomen, concentrates itself in the right iliac fossa, and at the end of several days the medical attendant notices that in this region a more or less extensive doughy swelling has replaced the first rigidity of the muscles on that side. The fever, which was before but little marked, rises and becomes remittent, with evening exacerbations ; the constipation may persist, but the stools are often diarrhœic. At the end of 12 days or so, there can no longer be any doubt that there exists in the right side of the abdomen a purulent collection.

The subsequent course of the affection depends on the treatment employed, and necessarily varies according as surgical interference is resorted to or not.

Such are, in their broad lineaments, the three principal forms of acute appendicitis, according as the affection pursues a rapid course, either towards resolution, or towards perforation with diffused peritonitis or with localized peritonitis.

We call the first form *simple parietal appendicitis with appendicular colic* ; the second, *hyper-acute perforative appendicitis* ; the third, *acute appendicitis with partial peritonitis*.

But these three forms do not exhaust all the modalities of the disease. There still exist cases where the appendicitis begins in a sudden and acute manner, and the accidents then take on an insidious,

slow and irregular course, with febrile attacks and apyretic intervals—periods of pain and periods of calm — with alternations of amelioration and aggravation, which may continue for weeks and for months. There are other cases where, after the onset has been vague and insidious, the symptoms having been characterized for some days by painlessness and semi-latency, all at once the disease takes on an acute character. In these cases either the perforation has already taken place into the peritoneum, though tardily and after numerous adhesions have had the time to be organized all around the appendix; or else the appendix, embedded in the retro-cæcal cellular tissue, and without immediate relation with the serosa, has ruptured into the connective tissue, and the rupture has caused a phlegmon of the ilio-lumbar region. I shall group these forms under the name of *sub-acute perforative appendicitis*.

Lastly, there exists a fifth clinical variety which, by its special evolution and by the operative problem which it raises, merits a description apart. I refer to *recurrent appendicitis*. This variety should be differentiated from the simple relapses which appendicitis sometimes presents. The recurrences habitually take on the clinical aspect of simple appendicitis with appendicular colic; the patient is none the less in danger of seeing at times the affection take on the character of one of the three other forms which we have briefly sketched.

16. HYPER-ACUTE PERFORATIVE APPENDICITIS.

We shall describe, in the first place, this hyper-acute form, because it represents the clinical type, which is the most clear, the best defined, and the most easily recognized.

The perforation may take place at all periods of the appendicitis, just as it is a permanent menace in all the periods of simple ulcer of the stomach. But just as there exists a special form of round ulcer of the stomach called *perforating ulcer of young women*, of which the perforation is, so to speak, the first and the only symptom, so there exists a form of appendicitis which by its characters, its fulminant course and its rapidly fatal termination, deserves to be specialized under the name of *hyper-acute perforative appendicitis*.

This is the form that we proposed in 1882 to distinguish from the other forms of typhlitis by the name of acute perforative typhlitis. We indicated at that time the mechanism of the perforation by the direct action of microbes, and the indirect action of the coprolith playing the part of an obstructing plug.

Although the mechanism of the perforation is, we believe, the same in the other forms of perforative appendicitis, here the consequences of the obstruction of the canal, and the compression exercised on its walls, are brought to their maximum of intensity.

In order that this form may be observed it is necessary :

1. That the strangulation produced at the base of the appendix by the foreign body introduced into its cavity shall be as complete as possible;

2. That the appendix shall be free in the peritoneal cavity.

The first condition determines the immediate gangrene of the walls of the appendix which become rapidly perforated in one or more points ; the second has for its consequence the instantaneous diffusion of the inflammation to the entire extent of the serosa.

Hence this form is seen chiefly in healthy persons without any hereditary predisposition to appendicitis, as far as can be known. It has been said that the perforation is not ordinarily produced during the first attack ; this is true in a certain measure for the other varieties of perforative appendicitis, but it is not true for the hyper-acute form. Recurrent appendicitis may, it is true, in some cases, give rise to a general peritonitis, but the first attacks will always have been wide apart, but little marked, and of no more consequence than any simple appendicular colic ; in general, it determines only a localized perityphlitis.

The symptoms and the evolution of hyper-acute appendicitis present a remarkable uniformity. All the observations of this kind are similar, and seem, so to speak, modeled the one on the other.

There are two distinct periods: the preparatory period which precedes the perforation, and which we have proposed to call the period of appendicular colic, and the peritoneal phase, which follows the rupture of the appendix.

1. *Period of Appendicular Colic.*—This first period may be very short, and not exceed 24 hours; ordinarily it is prolonged from two to three days. After one of the occasional causes indicated above, an indigestible or too copious meal, for instance, the patient is taken, sometimes, with a violent attack of abdominal pains, rapidly followed by one or more vomitings of food or of bile, at other times with dull heavy pains, which are more easily borne. These pains have sometimes their maximum of intensity on the right, and seem to radiate from the iliac fossa on that side; but very often they are diffuse, peri-umbilical, and do not differ from an ordinary colic.

When they are very intense, there is from the first obstinate constipation; when they are dull, the patient may have one or two natural stools.

Whether they have begun severely or mildly, these colics persist for two or three days; there may even then be a lull of from 12 to 24 hours, during which the patient thinks himself cured.

The fever at this moment does not exist, or at least it is but little marked; there is only gastric embarrassment, with dirty tongue, bad taste in the

mouth, want of appetite. This period corresponds to the engagement of the stercoral calculus in the appendix, and to the work of destruction of the microbes in its walls.

2. *Peritoneal period.*—Suddenly, the second or third day, the scene changes; the abdominal pain reappears with extreme intensity, and this time it is certainly most marked in the right iliac fossa; rapidly it diffuses itself all over the abdomen and becomes intolerable.

This new attack of pain indicates that the perforation has taken place into the peritoneum, and thenceforth the symptoms are those of peritonitis by perforation. The pain, although general, is especially felt in the right side of the abdomen; it is continuous, with moments of exacerbation; the least movement, the least contact immediately exasperates it. The pressure of the hand increases it everywhere, but especially in the loin and in the right iliac fossa; the difference is sometimes so well marked that the physician is led to doubt of the extension of the peritonitis to the left.

The abdomen is not generally tympanitic, it is, on the contrary, flat; sometimes almost excavated, but extraordinarily hard and tense, especially on the right side; a certain degree of meteorism may develop if the disease is prolonged. The rigid contraction of the abdominal muscles no longer permits exploration or serious palpation. Percussion itself

is very painful; it shows moreover a sonorousness almost normal, and does not furnish any useful information except in certain cases when, towards the end, shortly before death, there is noticed a slight degree of dullness on the right, due to the predominance of the membranous exudation at that point.

The vomitings, which had ceased with the first attack of colic, reappear at the moment of perforation with the characters of peritoneal vomiting. They are at first incessant, repeated; the patient rejects everything that he swallows, foods, drinks, medicines; the vomitus soon becomes porraceous and greenish, often fæcaloid, under the form of a yellowish pea-soup liquid.

To the vomiting is added an obstinate constipation. Neither purgatives nor lavements bring away anything, not even gas. This absolute suppression of the intestinal functions, due to reflex paralysis of the large intestine, taken in connection with the fæcal vomiting, might lead one to suspect internal strangulation, and many a mistake of this kind has actually been committed. In this regard peritonitis by perforation of the appendix does not differ from other kinds of peritonitis by perforation, whether the seat of the perforation be the stomach, the duodenum, the gall bladder, etc.

The bladder and even the kidney undergo the same effects of inhibition as the large intestine.

There is not only retention of urine, but even oliguria, and sometimes anuria. Not only does catheterism become necessary in order to empty the bladder, but only a small quantity of urine can be obtained by the catheter. This urine is high-colored and dense ; if treated by Gubler's test, the nitric acid gives a disk of albumen of greater or less thickness, and below that a bluish or indican-violet disk. There may be little or no albumen, but in treating the urine by hydrochloric acid and chloroform, one will always find indican in abundance.

These disturbances of the urinary secretion are the ordinary consequences of the peritoneal shock ; they are probably of neuro-vascular origin. We may make three suppositions :

1. The albuminuria is due to the elimination of toxic intestinal products reabsorbed by the blood, and then excreted by the renal filter, where they irritate the glomerular epithelium. This is the hypothesis proposed by English to explain the albuminuria of hernial strangulation.

2. It is due to the elimination of microbes proliferating in the peritoneum, and easily passing from the peritoneum into the blood, to be then eliminated by the kidney.

3. It is due to the retardation of the glomerular circulation, a consequence of the general fall in the arterial tension.

The two first suppositions are not demonstrated;

the probability of the third is attested, on the one part, by the oliguria which always accompanies the albuminuria, and on the other by the feebleness of the cardiac pulsation and the smallness of the pulse, which are always observed in such cases.

The violence of the abdominal shock explains, moreover, the characters of the thermic curve. The temperature is never very high; it rarely exceeds 39° C., and ordinarily stands between 38° and 39°; sometimes it even falls below the normal, and the central coincides with the peripheral depression of temperature.

The facies of the patient is characteristic; it is the facies abdominalis or Hippocraticus: the visage is excavated, contracted; the eyes sunken, with black circles; the nose pinched; the extremities are violaceous, and cold; the voice feeble and broken. The beatings of the heart are precipitate and feeble, though regular; the pulse is small, without force, frequent, and becomes more and more shabby. The patient lies prostrate on his back, with thighs semi-flexed; moves with pain, the least movement aggravating his abdominal sufferings; his groans are continuous; the respiration is short, dyspnoic. Often an incessant hiccough adds to his torments; there is burning thirst, the mouth is dry, the tongue covered with a dirty or fiery red coat.

Death ordinarily ensues on the eighth or ninth day. In 176 cases collected by Fitz, death super-

vened in the first week in 98, and in the second week in 54 ; in only 24 did the patient survive more than a fortnight.¹

In certain cases a fatal termination is very rapid ; it may take place the second, third or fourth day, according to the statistics of our American authority. But it is not altogether clear whether this writer reckons from the onset of the sickness or from the moment of the perforation.²

What is certain is, that with the same apparent lesions, there are cases where the peritonitis is, so to speak, fulminant, and others where the course is more slow. It is probable that cases of the first kind are in relation with an exudation which is highly septic ; those of the second class, with a peritonitis predominantly purulent. The first kill rather by blood-poisoning ; the second by exhaustion. It is to be hoped that the bacteriological study of the exudation will some day give the key to these differences. While waiting for such help, we believe

¹ These are Fitz's statistics for the first week :

Death on the second day.....	8 cases.
“ “ “ third “	20 “
“ “ “ fourth “	12 “
“ “ “ fifth “	20 “
“ “ “ sixth “	16 “
“ “ “ seventh “	22 “

Besides, 54 died on the first week, 8 in the third, 7 in the fourth, 4 in the fifth, 4 in the seventh, one in the eighth ; but these cases must surely have been cases of partial suppurative peritonitis.

² Certainly from the onset of the attack. Tr.

that the following clinical features will enable one to distinguish these two varieties of diffuse peritonitis.

Septic peritonitis is characterized by the violence and rapid progress of the accidents. It is this type which we have had chiefly in view in our description. It is to it that belong the abdominal collapsus, the extreme prostration, with general coldness, the fall of the central temperature, the scanty vomiting, the general rigidity of the muscles of the abdomen, characterized rather by hardness and flatness than by meteorism with barrel-shaped belly, the extreme oliguria with albuminuria and indican in the urine; lastly, the rapid death in several days. The patients succumb two, three or four days after the perforation; it is rare that they survive to the end of the first week.

In the peritonitis which is predominantly purulent, the evolution is less boisterous and less continuous. There are from time to time more acute attacks of pain, of fever and of vomiting. There is the abdominal cast of countenance, but the facies is less pinched, less depressed. The general depression of temperature is lacking. The central temperature is higher and may by moments attain to 40° C. The belly is not hard and tense, but more or less tympanitic. The vomitings are more frequent and the constipation less absolute. The urine is scanty and high-colored, but may be free from indican and albumen.

Lastly, the disease may be prolonged 12 or 15 days and even more, while being not less surely fatal than the septic form, unless the surgeon saves the patient by a laparotomy.

17. SIMPLE PARIETAL APPENDICITIS WITH APPENDICULAR COLIC.

Hyper-acute appendicitis represents the type of the affection at its maximum of gravity; at the other end of the series is placed simple appendicitis with the minimum of intensity. The causes, the mechanism, the mode of the onset, are the same; but the perforation does not take place: everything is limited to simple inflammation, *catarrhal* or *parietal*, of the appendix, and in a few days the symptoms abate and disappear. The peritoneal phase is then wanting, the lesions are limited to the appendix, although in certain cases the violence of the sympathetic phenomena may go so far as to resemble peritonitis and produce that symptomatic aggregate which Gubler designates by the name of *peritonism*.

This simple appendicitis corresponds to the affection which the old writers described under the name of *stercoral typhlitis* and of *simple typhlitis*.

We have shown (see paragraph 6) that all the symptoms attributed to typhlitis are easily explained by the irritation of the appendix; the sudden onset by the engagement of the stercoral calculus in the

appendicular canal, the radiating and paroxysmal pains, under the form of colics, by the reflex excitation of the intestine, starting in the mucosa of the duct in contact with the foreign body, the vomitings due to the same excitation, propagated to the stomach, the constipation and meteorism by paresis of the muscular coat of the intestine, according to the mechanism common to all violent pains of the abdominal region, whether this pain has its starting point in the stomach, the ureter or the bile ducts.

As for the tumor, described as an elongated, cylindrical mass, dull to percussion, and moulded to the form of the cæcum, it does not exist in the large majority of cases. In the first days of the attack what is noticed is a contracture of the abdominal muscles on the right side, a contracture similar to that which is observed over the region of the liver or stomach when these organs are the seat of a severe pain. This muscular rigidity prevents at the onset all deep exploration. When it yields with subsidence of the pain, it is possible in some cases to find a tumefaction more or less elongated, resembling the form of the cæcum, and due to the stasis of fæcal matters. This stasis is, in that case, simply the consequence of paresis of the large intestine, just as is the constipation and the tympanites ; it is not the cause of the accidents. But this stercoral tumor is rarely met, being often

merely an illusion, created and maintained by a preconceived notion; and in all cases it is always observed posterior to the explosion of the accidents.

It seems to us useless to take up one by one the symptoms of simple appendicitis. It is preferable to establish several clinical varieties, according to the intensity of the crisis and the rapidity of its evolution. We shall admit three principal varieties: Appendicular colic, a medium type, appendicitis with peritonism or pseudo-peritonitis.

1. *Appendicular Colic*.—This is the simplest aspect under which the accidents can present themselves. The symptoms may be of extreme violence, but they are always of short duration, and everything is restored to the normal order at the end of 12, 24 or 36 hours, either spontaneously or in consequence of a subcutaneous injection of morphine or some other calmative means. This variety markedly resembles an attack of hepatic or renal colic. According to its intensity, it may and must often be confounded with one of these calculous crises, whether accompanied with an indigestion or a simple intestinal colic.

In fact, it is really a case of intestinal colic, attended with vomiting; it is specialized by the origin of the pain, which is the appendix, and this starting point may be clinically determined by the existence of a fixed painful point of extreme sensibility. This point corresponds to the base of

the appendix ; it is seated exactly in the right iliac fossa, on a line drawn from the umbilicus to the antero-superior spine of the ilium, about four fingers' breadth inside of the spine. This is what is called *MacBurney's point*.

If the crisis never returns, there will always remain a doubt concerning the diagnosis. But the reality of this appendicular colic is attested by the following facts :

1. One often witnesses similar crises in the antecedents of subjects who eventually have an attack which presents the indisputable signs of acute appendicitis, perforative or non-perforative.

2. It is one of the habitual episodes of so-called recurrent appendicitis. M. Charles Leroux has published a case of this kind remarkable for the clearness, the violence and the frequency of the crises, in the *Revue des maladies de l'enfancé*.¹

3. Lastly, the early operations of American surgeons, made in consequence of one of these recurrent attacks, have shown that often the appendix presents no lesion capable of explaining the observed symptoms. Dr. Bull has reported, among others, two cases of this kind. In one case the patient was a physician; the excised appendix appeared normal; it contained no fæcal concretion, and there existed in the vicinity no trace of old or recent peritonitis or

¹Ch. Leroux. *Revue des maladies de l'enfancé*, January, 1891.

of adhesions. In the other case the appendix was found simply bent on itself; it enclosed neither liquid nor scybala, it was merely somewhat thickened; but surely this slight thickening of the walls could not account for the painful crises.¹

In these conditions it is necessary to admit a cause of irritation so transient as to leave no serious trace of its passage. And what hypothesis more probable than that of a stercoral calculus penetrating suddenly into the muscular canal of the appendix, provoking the spasmodic contraction and all the painful consequences which proceed from such a contraction, then falling back into the cæcum, and, in becoming disengaged, bringing on the cessation of the crisis?

What characterizes this first clinical form is its sudden termination without other accident. The painful crisis having subsided, all is over. On the next day pressure over Mac Burney's point will scarcely awaken any sensibility; but there is neither muscular rigidity nor deep swelling, nor anything which indicates any inflammatory process whatever. All is then limited, as in hepatic or renal colic, to a nervous crisis, to the painful and reflex phenomena provoked by the excitation of the duct.

2. *Ordinary Mean Type.*—But, as we have said, the fæcal concretion may remain engaged in the appendix, impeding the parietal circulation suf-

¹ Bull. New York Med. Record, April 26th, 1890.

ficiently to facilitate the inflammation of the walls, not enough, however, to determine their gangrene, whether because the foreign body is less voluminous, or because the walls are more extensible. In these conditions, the initial attack of colic is followed by a localization of the pains in the right iliac fossa, with elevation of the temperature more or less marked, in relation with the parietal inflammation of the appendix.

We shall give an idea of this form by reproducing the following observation, which sums up its exact symptoms:

A man aged 35 years, of habitually good health, is suddenly taken one day while breakfasting with a violent abdominal pain, which he compares to a colic. This pain, which at first extended all over the belly, soon becomes localized in the right iliac fossa. In the evening he has a stool and several bilious vomitings.

The following day he awakes with fever, general malaise, anorexia; there are three or four vomiting spells; pain always very severe; there is also constipation. These symptoms persist the following days, except the vomiting, which does not reappear.

The sixth day the following condition is observed: The patient complains of violent pains in the right iliac fossa; he localizes this pain exactly four fingers' breadth outside of the median line, a little below the antero-superior spine of the ilium. Pressure

made on this point with the finger provokes a very severe pain. The belly is not tympanitic; but the abdominal wall offers great resistance to palpation over the region of pain. The temperature is 38° C.; the evening of the preceding day it was 38.4°. Fifteen leeches *loco dolenti* are prescribed, and castor oil is given in teaspoonful doses every half hour. The subsequent history is as follows:

After taking the purgative, the patient had seven or eight greenish stools, very fetid, composed of solid matter and of mucus, which he compared to white of egg. The iliac pain was less; the abdominal wall was still resistant; no tumor was perceived by palpation. The fever was gone; M. T. 37° C.

The eighth and ninth days the condition was the same; constipation, which necessitated another purgative of oil; abundant stools. The iliac region was continually painful. No fever.

The tenth day the abdomen could be freely manipulated, and by palpation there was noticed a small elongated tumor of the size of the thumb, painful to pressure, situated a little inside and below the antero-superior spine of the ilium.

The following days the patient continued to complain of the iliac pain, especially when he arose. He left the hospital the nineteenth day in spite of our protestation. The small tumor, painful to pressure, persisted in the iliac fossa.

We see, in summing up, that we had here an

affection of little gravity, pursuing its course quite rapidly in from eight to fifteen days, and of which the symptoms reproduce exactly the clinical picture formerly ascribed to simple and stercoral typhlitis. There are two kinds of pain: one *fixed*, iliac, limited, and quite clearly circumscribed, corresponding to the inflamed appendix (Mac Burney's point), complained of by the patient and provoked by pressure; the other, *paroxysmal*, diffused all over the abdomen, which does not differ from the ordinary pain of intestinal colic, and which is moreover due to the same cause: the reflex contractions of the large intestine.

The fever is not pronounced; but the constipation is habitual.

To the fixed pain there corresponds a sense of resistance, a rigidity of the abdominal muscles of the right side, which in the first days prevents deep palpation.

When this painful contraction yields, there is then noticed, in depressing the wall of the iliac fossa, a small elongated tumor, sensitive to touch, of the size of the finger, which is simply the inflamed and distended appendix.

In the simplest cases this tumefaction undergoes resolution and gradually disappears; in others, on the occasion of a movement, a strain, an indiscretion in diet, to the first attack there succeeds another which yields quite as rapidly as the first, but which

may take on a course more acute, with peritoneal complications. Sometimes, in the same sickness, three or four exacerbations of this kind succeed each other at short intervals with violent paroxysmal pains. It might be supposed that in these cases there is a simple displacement of the scybalum in the appendix. When one of these attacks is prolonged, one may well fear, however, the extension of the inflammation to the neighboring peritoneum.

Patients that have had an attack of appendicitis, ordinarily remain affected with constipation and an atony of the large intestine difficult to overcome. Sometimes the atonic dilatation of the large intestine predominates in the cæcum, which then forms a veritable gaseous tumor in the iliac fossa. They are, besides, exposed to further attacks at greater or less intervals, and the initial crisis is often only an episode of recurrent appendicitis.

3. *Appendicitis with peritonism or pseudo-peritonitis.*—In cases where there is, anatomically speaking, nothing but a simple inflammation of the appendix, the symptoms of nervous irritation may in exceptional cases be sufficiently intense to induce belief in a peritonitis, diffused or localized.

The pseudo-peritonitis of hysterical women is well known. Under the influence of an intense general excitation, of a menstrual trouble, or perhaps of a slight lesion of the tubes, suddenly all the symptoms of an acute peritonitis are seen to supervene: ex-

cruciating abdominal pains, extreme hyperæsthesia of the belly, porraceous vomitings, pinched facies, chilling of the extremities, frequency and smallness of the pulse, sometimes even slight thermic elevation, without the existence, however, of anything but a painful contraction of the abdominal muscles. The same phenomena may be observed in the hysterical man; we have just seen a remarkable instance as the sequel of an abdominal traumatism. It is easy to understand, then, that in nervous subjects, and for a stronger reason in the hysterical, a severe pain radiating from the appendix may provoke similar consequences, which may resemble, now a general inflammation of the serosa, now a partial peritonitis of the right iliac fossa, with localized tumor.

We see hardly any other explanation than localized peritonism to give of the observation reported by Dr. Shrady of New York. It concerned a physician affected with recurrent appendicitis. Three of these attacks were observed by Dr. Shrady; the fourth took place in Paris, where the patient was seen by a distinguished surgeon, who made the same diagnosis. Each of the recurrences was accompanied by symptoms which warranted the fear that an abscess was in process of formation: dullness, sensibility to pressure, rigidity of the walls, slightly œdematous swelling in the vicinity of the cæcum. At each crisis, the question of surgical intervention was agitated, both in Paris and New York. The patient affirmed that he

was ready to undergo all the risks; but each time the symptoms abated, and gradually disappeared. This physician having succumbed to an intercurrent malady, some time after the fourth attack, Dr. Shrady performed the autopsy, as he had promised to do, and noted that the appendix was perfectly healthy; it was not even thickened; neither the pericæcal tissue nor the peritoneum presented the slightest trace of inflammation.

The absence of appendicular lesions in a certain number of cases of recurrent appendicitis operated upon is not absolutely rare; these facts justify our theory of appendicular colic. But in view of the local signs observed during life, how shall we interpret the absence of all peritoneal lesions? We cannot admit that at each crisis there takes place an attack of fibrinous peritonitis of which the resolution is completely effected. Four acute attacks of peritonitis would surely have left some adhesions. We must then believe that Dr. Shrady's patient was a victim of nervous pseudo-peritonitis, which gave rise to a misleading sensation of localized tumor.

18. ACUTE APPENDICITIS, WITH LOCALIZED PERITONITIS.

This form includes most of the cases described under the name of acute perityphlitis. We must distinguish two varieties, according as the appendicitis is perforative or not, and according as the peri-

tonitis remains fibrinous or suppurative. It is not demonstrated that a non-perforative appendicitis cannot give rise to a purulent peritonitis or that a fibrinous peritonitis may not be observed along with a perforative appendicitis. But these two eventualities are certainly exceptional, and as practically there is no interest in multiplying to excess these clinical forms, and it will not do to base a description on exceptions, we will only admit two varieties, acute appendicitis with fibrinous peritonitis, and perforative appendicitis with circumscribed purulent peritonitis.

a. Acute appendicitis with partial fibrinous peritonitis.—With a greater intensity, this variety reproduces the symptoms of simple appendicitis; it gives rise besides to a painful tumefaction of the right region of the abdomen, a tumefaction which progressively undergoes resolution, and which is not observed when the appendix alone is the seat of lesion. Here the inflammation spreads rapidly by continuity of tissue to a certain extent of the neighboring peritoneum. This peritonitis is the analogue of the pleurisy which accompanies cortical pneumonia, and of the local pelvic peritonites which supervene in the female around the uterine annexes.

It remains fibrinous, then it terminates by resolution. Although certain authorities seem to believe that suppurative perityphlitis may get well by resolution, we are inclined to doubt this. Encysted

suppurative peritonitis sometimes gets well, as we shall see, but on condition that the purulent collection shall be evacuated either externally, spontaneously or by the bistoury, or into some one of the neighboring organs, the rectum, cæcum, etc. If resolution takes place by medical means, it is because there was no pus.

This appendicitis with fibrinous peritonitis corresponds, then, to the cases described by the old writers as simple perityphlitis terminating in resolution. They placed the seat of the lesion in the peri-cæcal cellular tissue, and regarded it as a phlegmon stopping short of the period of suppuration. This is possible in some cases, but here also, as in the following form, an early laparotomy shows what the physical signs already had indicated, that the case is generally complicated with a peritoneal inflammation.

The following observation, borrowed from the memoir of Roux, of Lausanne,¹ is one of many which confirm this view. It will give at the same time a general idea of the progress of the disease

A boy aged 15 years, affected with dyspepsia with habitual constipation, remained constipated from May 31st to June 3d; then was taken with profuse diarrhœa with violent pains all over the abdomen. In the night of June 4th-5th, about 3 A. M., severe

¹ *Revue Medicale de la Suisse romande*, October, 1891, p. 581.

pains in the ileo-cæcal region; continuance of diarrhœa; no vomiting. Despite his pain the boy walked to the hospital.

June 6th, the following condition was noted: Patient a good-sized boy, a little pale; tongue but little coated; abdomen normal with the exception of a little bulging at the epigastrium, as well as at the external limit of the right rectus abdominalis below the umbilicus. This slight prominence is more marked by the side of the right iliac spine and along the external half of Poupart's ligament.

On palpation, which was painful, there was felt in front of the spine, at the most sensitive point, an ovoid resisting body adherent to the external half of Poupart's ligament, which extended inwardly and below as far as the iliac vessels, and outwardly to the spinoso-umbilical line, and upwards to the middle of this line. This tumor presented a prolongation in the direction of the umbilicus as large as a pigeon's egg. Nowhere was the dullness absolute; the colon, supple, painless, was empty. There was no lumbar pain; no trace of swelling of the cæcum. A laparotomy was performed, through without any precise indication for the operation, as the diagnosis which suggested itself was simple catarrhal appendicitis without abscess and without perforation.

The usual oblique incision under ether was made down to the abdominal cavity, when there issued an abundant quantity of lemon-yellow serous liquid.

The vermiform process was found tumefied and projecting, resembling the penis of an infant in erection. Its length was eight centimetres; it was very turgescient, resistant to pressure, and did not appear to contain any foreign body. It was accompanied by its mesentery as far as its extremity. Its point of insertion and its base were covered by fibrinous membranes which were lacking elsewhere.—Ligature of the mesentery; resection of the appendix at half a centimeter from its insertion, and walls sutured with catgut. The region was brushed over with a sponge wrung out of a sublimate solution.

Recovery by first intention on the 16th of June, when the first and only dressing was removed.

It will be seen that the onset is the same as in the other forms of appendicitis already described; the appendicular period, characterized by diffuse abdominal colics, exists here as in the fulminant form or in simple appendicitis, preceding the localization of pains in the cæcal region. The peritoneal vomitings ordinarily accompany this localization; but the preceding instance proves that they may be lacking. Per contra, while in simple parietal appendicitis, one will notice by palpation only a painful rigidity of the muscles of the region, in appendicitis with peritonitis, from the first 30 hours, a tumefaction more or less limited is already appreciable in the right iliac fossa. In the case which we have just cited, this tumefaction was not large, and the

peritonitis was yet very limited, while the course of the malady was, moreover, suddenly and happily interrupted by surgical intervention.

But suppose the surgeon had been less bold and the operation deferred or declined, the appendicular peritonitis would probably have extended as it does in other patients when left to themselves. It would have agglutinated the neighboring intestinal coils, and so formed, with the false fibrinous membranes and the liquid effused among the coils, a tumor more or less voluminous, more or less hard, resistant, sensitive to pressure, dull at some points, sonorous at others, occupying the entire iliac fossa, extending more or less above and within, now fixed, now susceptible of a certain displacement *en masse*. This tumor is in general constituted with these characters from the fifth to the eighth day, and is more easily distinguished at this moment, when the muscular relaxation permits a methodical exploration.

In such a case, the peritoneal symptoms are naturally much more noticeable. The pain in the right side is intense, preventing the patient from moving, and is aggravated by the least contact; the vomitings are frequent, the nausea almost continual; gastric disturbance, with dry and saburral tongue, is sometimes very marked. The fever is very irregular; it may be high at the onset, exceeding 39° C., but it soon falls to 38° or 39° C.

At the end of six, eight or ten days the acute peri-

toneal attack subsides; the symptoms amend, the tumor steadily diminishes, while the intestinal functions are reëstablished. An average of 15 to 20 days suffices for the resorption of the peritoneal exudation; after which nothing is found in the iliac fossa but a small mass, elongated, ovoid, rolling under the finger, which is the appendix still surrounded with plastic products, and not, as was formerly taught, a relic of the phlegmonous induration of the sub-peritoneal cellular tissue. The resorption of the fibrinous effusion may be, however, very slow, and sometimes there is felt, even at the end of five or six weeks, a hard, sensitive tumor as large as the fist, which gradually disappears unless, indeed, a relapse takes place.

b. Acute Appendicitis with Circumscribed Purulent Peritonitis.—The different forms of appendicitis which we have just indicated may be described under the name of *medical appendicitis*, the intervention of the bistoury not being demanded in cases of this kind. Appendicitis with suppurative peritonitis represents on the contrary true *surgical appendicitis*, and can hardly be said to be curable without a surgical operation.

The first phases are identical with those of the preceding variety: a preparatory period of appendicular colic, followed at the end of 24 to 48 hours by signs of a localized peritonitis, intense iliac pain, vomitings, extensive tumefaction, steadily spreading over the entire right side of the belly.

In some cases, even, the symptoms of the onset do not differ from those of hyper-acute perforative appendicitis; that is to say, the phenomena of peritonitis are at first generalized, with retraction of the belly, general sensibility of the abdomen, collapsus, and coldness of the extremities. Then little by little the phenomena are seen to amend, to become localized towards the right side of the belly, while the painful tumefaction plainly manifests itself in this region.

It would seem, then, that two varieties of onset must be admitted: the one where the peritonitis, more or less limited at first, tends to spread farther and farther—*progressive* peritonitis; the other where the peritonitis, at first generalized, tends to retrocede, becoming localized, *regressive* peritonitis.

But it is very difficult to say whether in this second case there is really general inflammation of the serosa, or whether we have to do simply with sympathetic phenomena of nervous irritation, propagated at first all over the peritoneum, then disappearing at the end of several days, only to give place to signs really due to local inflammation.

During this phase constipation is the rule, sometimes going so far, when meteorism is marked, as to simulate an obstruction. In other cases there is alternation of liquid stools and of fæcal retention. Later, when the purulent collection is very limited, a continual diarrhœa may be observed; but most

often lavements are necessary to empty the inert intestine.

The fever is likewise very variable. To judge from the published reports, which are not very explicit in this regard being generally cases put on record by surgeons who give few details except with reference to the operation, the fever is not high, not exceeding 39° C.; in a small number of cases it is normal or nearly normal at the moment of operation, about the seventh or eighth day.

In a case which I have just observed, the fever pursued the following course: During the first three days which followed the perforation, the temperature oscillated between 39° C. in the morning and 40° to 40.6° in the evening. At the end of the fourth day it fell to 38.6° – 38.8° , to oscillate the sixth, seventh, eighth and ninth days between 38° and 38.5° . The tenth day it rose again to 39.2° in the morning, 40° in the evening, remaining on the following day between these figures. Then the operation was performed by M. Richelot, with discharge of a great quantity of turbid serous and fetid pus. It seems, then, that there was, after the initial febrile inflammatory invasion, a period of almost apyretic remission, followed about the tenth or eleventh day by a new rise of temperature.

But it would need new observations carried farther to decide: first, whether this course of the fever is habitual; and in the second place, whether

this thermic ascension is due to a new peritoneal invasion, or, on the contrary, to the resorption of septic products, or finally, to purulent transformation of the exudation. But we cannot any longer admit, as a general rule, this last hypothesis; if it may be true in the case of acute non-perforative appendicitis, it is certain—and the early operations prove it—that 48 hours after the perforation has taken place there already exists, though in small quantity (not more perhaps than a few spoonfuls), fetid pus in the peritoneum in the neighborhood of the diseased appendix.¹

Whatever may be the course of the fever (a question still not precisely settled, but waiting further observations), it is on the character of the iliac tumefaction that we must mainly rely.

a. Characters of the Purulent Collection.—At what moment does it first appear? or, at least, is it perceptible by palpation? The period is quite variable; the meteorism on the one hand, the muscular tension and the pain on the other, often prevent exploration. It may be admitted that the tumor becomes appreciable between the second and the seventh day. In twenty-four cases collected by Fitz, where this detail is noted, the following dates are observed:

¹ In a case published by Peckham (*Boston Med. and Surg. Journal*, 1882, p. 159), where the patient succumbed on the fifth day, there was found in the iliac fossa an encysted peritonitis containing nearly three pints of fetid pus.

Second day.....	3 times.
Third “	4 “
Fourth “	2 “
Fifth “	4 “
Sixth “	5 “
Seventh “	4 “

Besides, in one case the tumor could be felt from the first day, and in another only on the eighth.

We must not expect always to find a limited tumor; in some cases, however, in the first two or three days there may be felt a small, elongated, oval mass, in the right iliac fossa (several observations of Roux, of Lausanne). In one case, it is said that the patient herself had, on the second day, felt a little globular swelling in her right fossa.

But this is extremely rare, and usually the tumor is formed not only by the sac in which the pus accumulates, but also by the neighboring intestinal coils, agglutinated by plastic peritonitis developed in the vicinity. It is the extension of this perityphlitic peritonitis which makes the volume of the tumor, and not the mere size of the purulent collection. The tumefaction may indeed occupy the entire right half of the abdomen, rising even above the umbilicus, and nevertheless the abscess properly so-called will not exceed the size of the closed fist. When the omentum is inflamed and thickened, the dimensions of the tumor may still be considerable.

It is then rather a diffuse puffiness, more or less

extended, than a veritable tumor which palpation reveals. One may, however, according to Roux of Lausanne, when the abdomen is not too painful or resistant, feel a clearly defined ovoid tumor, parallel to Poupart's ligament and rising more or less above the iliac crest; this is observed especially when the appendix is situated directly below the cæcum.

Percussion over this tumefaction gives a slight degree of dullness, sometimes even complete dullness in certain points; but in the immediate neighborhood a tympanitic sound is obtained which may obscure the dull sound. The intestinal coils, distended and agglomerated, account for this tympanism, which may be due in certain cases to the presence of gas in the pus cavity.

Rectal exploration must be practised with care in all cases of appendicitis. With this, in the case of a woman, the vaginal touch must be associated. During the first few days, doubtless this investigation will furnish but little information, although, according to Treves, one may thus succeed in feeling the dilated appendix. But when the pus accumulates, especially if it tends to point towards the pelvis, a more or less hard or fluctuating tumefaction may be detected.

The relations of the appendix explain certain accessory symptoms which may be observed in the course of this localized peritonitis; such, for instance, as the painful irradiations towards the thigh or

towards the testicles, the impairment of motion of the right lower extremity, the tenesmus or frequent desire to urinate.

b. Modes of Termination.—In default of surgical intervention, how does this suppurative peritonitis terminate? May it resolve and get well by resorption? Although some affirm this, and although Renvers pretends to have seen several patients completely cured by medical means, in whose cases an explorative puncture had revealed the presence of pus,¹ I strongly doubt whether the putrid and fæcaloid pus which results from the perforation of the appendix may ever be completely resorbed. It is possible, if the purulent collection is very small, that this pus may be encysted and remain inoffensive for a certain time. But a recurrence is, so to speak, fatal in such a case; and these little juxta-appendicular foci, in acting as an inflammatory thorn, are, as we shall soon see, the anatomical cause of one of the varieties of recurrent appendicitis.

If the case be left to itself or to purely medical treatment, the modes of termination may be:

1. A diffuse peritonitis, rapidly fatal, either by simple extension of the local inflammation, or, after a variable period, on the occasion of a strain, of a too energetic exploration of the abdomen, etc., by the giving way or rupture of the plastic barrier formed around the purulent focus.

¹ Society of Internal Medicine of Berlin, session of January 23d, 1891.

2. One of the extraordinary complications which we have cited above: ulceration of a blood-vessel, large vein or large artery of the region, with hæmorrhage, or pylephlebitis giving rise to abscesses of the liver; purulent extension toward the diaphragm, with perforation and purulent pleurisy or pneumonia.

3. Bursting of the purulent collection, either externally or into one of the neighboring cavities, cæcum, rectum, bladder, vagina.

From the point of view of the relative frequency of these different terminations, Bull¹ has collected statistics of sixty-seven cases, with the following results:

Bursting externally	28 cases.
“ into the cæcum	15 “
“ “ “ rectum	2 “
“ “ “ bladder	2 “
“ “ “ internal iliac artery	2 “
“ “ “ thoracic cavity	2 “
Death by pyæmia	8 “

In these statistics, the frequency of cases where the opening is external is evidently abnormal. In another statistical compilation (that of Paulier), in forty-six cases this termination is recorded as occurring only four times, while in fifteen the abscess opened into the cæcum.²

But whether the abscess opens externally or inter-

¹ Bull, *New York Acad. of Medicine*, January 3, 1875.

² Paulier. *Thesè de Paris*, 1875.

nally, there may be trouble. If the opening be on the outside, there ordinarily remains a fistula, which is long in closing. If it opens into the vagina, bladder, or intestine, the patient may indeed rapidly get well, but death by putrid infection and exhaustion is also possible.

19. SUBACUTE APPENDICITIS.

Perforative appendicitis is ordinarily an acute affection, with sudden and well-defined onset and a continuous progress, ending in the course of ten to fifteen days either in death, or in the formation of a purulent collection, which is limited and easy of detection. But it is not always so, and the disease may take on from the onset, or at some subsequent time, a slow, insidious, and deceptive course. These are the cases which we group under the name of *subacute* appendicitis.

Anatomically we may explain these cases in two ways: either the perforation takes place into the retrocaecal cellular tissue, the appendix being embedded in the cellular tissue and no longer free in the peritoneum, and the pus steadily infiltrates (without being at once collected into a limited abscess) the subperitoneal tissue or muscles of the region; or it may be that the appendix, prior to the actual crisis or during the first days of the sickness, becomes isolated by sufficient adhesions, from the great peritoneal cavity, and the perforation takes place in the midst

of these adhesions, in a sort of recess well walled in, where the pus accumulates without very marked inflammatory reaction.

From a clinical point of view, sometimes it is the general or subjective symptoms which are lacking or are ill-defined, while the local lesions progress quite rapidly and with the ordinary characters of appendicitis; sometimes, on the contrary, the general symptoms are present, but the local signs remain obscure, difficult to perceive, so that one will sometimes have the impression of a grave affection, of a deep suppuration, without being able to localize it.

I shall then make three varieties of subacute appendicitis:

1. Cases where the affection has a sudden onset, but where the symptoms are from the first insidious, little marked, or latent, the local peritonitis terminating rather rapidly with grave accidents;

2. Cases where the appendicitis has an acute and violent commencement, but soon calms down to give place to local and general phenomena ill-defined and difficult to interpret;

3. Cases where all is insidious and obscure, the onset, the general signs, and the local symptoms.

A. First variety.—Cases of this kind are only subacute subjectively, if we may use the expression; but the course is as rapid and continuous as in acute appendicitis. There is nothing to alarm the patient or the physician, neither violent pain nor intense

fever, and yet in a few days a purulent collection forms and may kill the patient before the diagnosis has been determined.

Fitz relates a case of a sailor who, in a voyage from Portland to New York, felt a pain in the right iliac fossa. He took a purgative, and, although suffering, continued to do service during all the following week. He then returned to Boston for treatment 13 days after the onset of the pain, but died the next day, and at the autopsy the appendix was found gangrenous, and there was an abscess in the right iliac fossa.

A man aged 42 years, observed by Roux, was taken without any known cause with pains localized at first in the right iliac fossa. But these pains were at first of so little violence that they did not prevent him from continuing his work as carpenter for a whole week. There were neither digestive troubles nor constipation. At the same time, these pains, which at first consisted in a little discomfort, became more intense about the eighth day, and obliged him to take his bed. Tongue was coated and there was some vomiting. The next day the patient felt better; pulse 92. Belly not tympanitic; little tender to pressure except in the ileo-cæcal region, but pressure also caused pain in the left iliac fossa. No very perceptible tumor was felt, nor any local bulging.

Roux at the same time did not hesitate to diagnos-

ticate an appendicitis with perforation, and to make an incision. There was a flow of pus, serous in character, clear and grayish, which seemed to be free in the abdominal cavity. The finger, introduced deeply into the wound, felt the appendix below the cæcum; it was embedded in a sort of pouch formed of peritoneal adhesions, and was extracted in gangrenous shreds, with a stercoral calculus in its cavity. The results of the operation seemed to be good; the temperature did not rise above 38° C., but the fifth day the patient died suddenly of a pulmonary embolus, which probably originated in one of the deep veins of the pelvis, inflamed and thrombosed—which seems to indicate that the purulent inflammation must have silently progressed farther and deeper than the incision made by the surgeon; the autopsy, however, was not made with sufficient care to demonstrate this.

B. Second variety.—In this category of cases the affection begins as suddenly as in the acute form, either by a crisis of appendicular colic, or, after several vague attacks of pain, by a sharp pain in the right iliac fossa. This sudden onset, complained of by the patient, should be the signal of alarm. But on the following days the pain abates or goes away altogether; no very clear abdominal symptom attracts attention; meteorism, resistance to pressure, muscular retraction, tenderness on pressure, are absent; the temperature remains normal; and it is

only at the end of 8, 10, or 15 days that fever appears, irregular, intermittent, accompanied or not by obscure pains in the right side.

If the appendicitis thus manifests itself in an individual of a certain age, subject to abdominal suffering or convalescing from some acute disease, the physician's hesitation to affirm an abscess due to intestinal perforation is easily understood. As palpation reveals only an obscure swelling in the cæcal region, the probability of a simple fæcal engorgement will be likely to be entertained; the fever will be ascribed to some gastric or other digestive disturbance. In short, the medical attendant will be lulled into a fancied security till the gravity of the situation at last compels a correct diagnosis.

[In the original a long report follows of the celebrated case of Gambetta, for which we have room for only the outlines.]

December 8th, 1882, Gambetta complained of severe pains in the belly. December 9th, the same pain, with nausea. In the evening, while at stool, an intense pain in right loin, lasting a part of the night. December 10th, pain is less sharp; anorexia; coated tongue; no tumefaction over belly; little tenderness on pressure over right iliac fossa; temperature remains normal.

December 11th, 12th, 13th, and 14th, patient felt quite well; was up and dressed; ate his meals with a fair appetite.

December 15th, discomfort in the abdomen and frequent eructations. A short walk in the park. In the evening an uncomfortable sensation of heat without a chill.

December 16th, was taken at dinner with violent colic; nevertheless rode out. In the evening another hot spell without chill; temperature rises to 39° C.

December 17th, temperature keeps at 39° C.; a slight swelling is found in right iliac fossa. Diagnosis, typhlitis.

December 18th, violent chill in the evening; temperature 39.9° C.

December 19th, new and repeated chills; two fingers' breadth above the right iliac spine a painful elongated and cylindrical tumefaction is felt on deep pressure.

The following days he had several chills, but felt better. General condition seemed to improve. The swelling in the right side increased. A large blister was applied over the swelling on the 23d. December 27th the symptoms all became worse. An attack of erysipelas followed the application of the blister, and spread over all the right side and even down the thigh. The patient succumbed December 31st. The autopsy revealed the appendix directed vertically above and behind the cæcum, perforated in two places, and floating in a sanious pus. The perforation had taken place in the retro-cæcal cellular tissue, and had caused the formation of a vast focus of

purulent and gangrenous infiltration, extending up to the kidney in one direction and to the vertebral column in another.

This case illustrates the insidiousness of the march of some cases of perforative appendicitis with localized purulent collection. For several days Gambetta was so comfortable as to think himself almost well. The diagnosis of stercoral typhlitis with subsequent propagation of the inflammation to the peri-cæcal tissue, was in accordance with the notions of the time. An early operation might possibly have saved this great man.

C. Third variety.—This third variety includes cases where all is obscure and deceptive—the onset, the local signs, and the general symptoms. The attack may come on in a subject of apparently good health; but generally, like cases of the preceding variety, the patient has been for a long time suffering from vague intestinal troubles, or is convalescent from some acute disease.

There is neither clear onset, nor fixed pain attracting attention to the iliac fossa. The affection begins merely by digestive troubles, want of appetite, vomitings, saburral tongue, constipation; the patient complains of dull colicky attacks, of some distension of the abdomen; there is no fever, or if there is any it is very slight; there is nothing to indicate any lesion of gravity. Moreover, the exploration of the abdomen reveals nothing to cause

alarm; deep pressure in the right loin is a little painful, but there is not excessive sensitiveness in that region, and the pain is like that experienced at other times by the same patient, either in the hypogastrium or in the left iliac fossa. The patient may continue to walk about and attend to his business.

In short, everything is calculated to relieve both patient and physician of anxiety and alarm, and danger is not apprehended till the appearance of remittent or intermittent febrile attacks, preceded or not by chills, announces, not indeed suppuration, for that has already been going on for some time, but probably the commencing infection of the organism.

Then, for the first time, the conviction is forced upon the medical attendant that he has to do with a deep purulent collection; and it would seem that the local signs, the more or less well defined swelling in the right iliac fossa, the especial sensitiveness of that region when deep pressure is made and the history of colicky pains, ought to be enough to put a wary practitioner on the right track.

But it is easy to understand that the most accomplished physician will sometimes fail to early diagnosticate these cases. When you think that it is in these insidious forms that purulent infiltrations take place, along the psoas, down into the pelvis, upward toward the kidney and diaphragm; that it is in these same deceptive forms that the abnormal complications of which we have spoken occur—the

thrombosis of the iliac veins, with pulmonary embolism; thromboses of the radicles of the portal vein with pylephlebitis, hepatic emboli and abscess of the liver, perforation of the abscess through the diaphragm into the pleura, with purulent pleurisy of the right side, and even of the left side, you will understand how easily the physician may be misled, especially if the disease has not been followed from its onset, and that it becomes more and more difficult for him to refer to their true cause phenomena so distant from the primary seat of the lesion.

Hence, we are warranted in asserting that next to hyper-acute perforative appendicitis with general peritonitis, sub-acute appendicitis is the most grave and formidable form of appendicular inflammation.

20. CHRONIC RECURRENT APPENDICITIS.

This form of appendicitis, called relapsing or recurrent, is one of the most interesting and important, though hitherto no full and connected description of it has been given; its importance being largely due to the fact that it was for this variety that the operation of excision and ablation of the appendix (an operation to be performed in the interval of two acute crises) was first proposed.

The name of chronic relapsing appendicitis ought to be reserved for cases where the relapses succeed each other very rapidly and at short intervals.

Cases where the attacks are repeated at very long intervals, being a year or more apart, are only recurrences, each crisis constituting of itself the whole disease, and not being necessarily dependent on any former attack. These previous attacks may be valuable data from a diagnostic point of view, and they may be an influential predisposing cause, but they do not justify us in making of these cases, occurring with such long intervals, a special clinical type, for apart from the recurrence, there is nothing to differentiate these from ordinary cases of appendicitis.

It is not so with recurrent appendicitis, properly so called. The latter has a course, modes and symptoms which are peculiar to it; it is really a chronic disease with successive attacks.

The radical and systematic treatment practised by the Americans has taught us what are the lesions which form the anatomical substratum of this variety of appendicitis. These lesions are generally those of a chronic inflammation affecting at once the mucosa of the appendix, its walls, and its peritoneal covering.

The appendix is thickened and dilated; the dilation may be considerable, giving to the organ the size of the thumb; its cavity is then filled with a thick and abundant mucus. Sometimes, in consequence of a flexion of the appendix, or of a partial constriction of its cavity consecutive to a cicatrized ulceration, the extremity alone is dilated. In this

case, the tension of the imprisoned liquid on the one hand, the thickening of the walls on the other, may give the sensation of a solid mass. In an observation of Treves, the extremity of the duct was so widened, so indurated, so perfectly rounded, that it seemed to contain a stercoral concretion. The appendix was bent on itself; on liberating and straightening it, the mucus flowed back into the cæcum and the appearance of a solid tumor at once disappeared. This flexion of the appendix, maintained by peritoneal adhesions, is a condition often noticed; it explains the retention of mucus which the mucosa continues to secrete and which cannot flow off into the cæcum.

In other cases, there is no dilatation; the appendix seems, however, to be transformed into a fibrous cord by the thickening of the walls, the canal being reduced to a narrow slit. It is then almost completely buried in the midst of adhesions, which are generally very resistant, the remains of repeated attacks of adhesive peritonitis. These adhesions not only involve the appendix, but also the neighboring intestinal coils and the omentum, a part of which may be found fixed in the iliac fossa, and give to palpation the feel of a tumor.¹ The plastic exudation may be so abundant, the adhesions so numerous and resisting, that the ablation of the appendix is rendered extremely painful and difficult.

¹ Case of Teale. *Recurrent typhlitis. Brit. Med. Jour.*, January, 1891

Finally, there have been rare cases where the appendix is found perforated, with a little juxta appendicular abscess, containing one or two spoonfuls of faecaloid pus and a small stercoral concretion. Dr. Lecorché has communicated to me an instance of this kind which he recently observed. A man, aged 28 years, had had nine relapses in the space of 20 months. He presented himself at the Hospital Dubois earnestly demanding an operation. This operation, made by Dr. Potherat, disclosed a perforated appendix communicating with a little pus cavity, and in this cavity a stercoral concretion kept there by adhesions.

How, according to these anatomical findings, shall we explain the repetition of the crises and the mechanism of the relapses? It is very probable that the cause of the paroxysms is not the same in all cases.

According to Treves, it is to the retention of the mucus in the appendix that the recurrent appendicitis is due. But Treves does not explain how this retention can provoke a painful paroxysm, accompanied by vomitings and peritoneal symptoms.

In my opinion, the partial or total distention of the cavity of the appendix by the mucus may serve to explain a certain number of facts. The mechanism of the crisis appears to me to be the same as in appendicular colic by the engagement of a stercoral concretion. The imprisoned mucus steadily dilates

the appendix; at a given moment this dilatation attains its maximum and causes painful contraction of the muscular coats of the appendix, hence the acute abdominal pain follows as the reflex consequence. As we have to do only with a liquid and not with a hard body compressing the blood vessels of the wall in such a way as to prevent nutrition, the appendix does not tend to become perforated; the muscular contraction has the effect of expelling the liquid towards the narrowed part, and the obstacle being formed solely by the bending or stenosis of the duct, the mucus passes slowly and little by little through the narrow passage, and is voided into the cæcum.

But not all cases are explicable in this way. Very often there exists no retention of mucus, nor any trace of stenosis, or flexion of the appendix, which could at any moment have given rise to such retention. The appendix is everywhere thickened by chronic interstitial inflammation of its walls. The painful crises, however, have not been less intense, nor less frequent. I think that the relapse in such cases must be explained by the temporary engagement of a stercoral calculus, which provokes the painful manifestations and an acute attack of parietal appendicitis by the mechanism which I have already described so fully. The expulsion of the scybalum into the cæcum, in consequence of the contraction of the appendix, brings about the end of the crisis.

On the other hand, the frequent observation of evident signs of chronic peritonitis, of peri-appendicular adhesions, of thickening of the peritoneum over the neighboring intestinal coils, shows that, in a number of cases, the recurrence must have for its cause an acute attack of plastic appendicular peritonitis, spreading more or less around the cæcum and into the right iliac fossa. Finally, when there is found in the neighborhood of the perforated appendix a small focus of pus containing a stercoral concretion or debris of faecal matter, whether or not the first crisis is due to the engagement of this concretion in the appendix, it is reasonable to assign the consecutive attacks to a sort of rekindling of peritoneal irritation by the presence of this faecaloid pus; the symptoms may be more or less grave and the duration of the relapse more or less prolonged, according to the extension taken by this inflammatory recrudescence.

It is seen that the study of the facts hardly permits us to assign the same mechanism to all relapses of appendicitis. Hence there are necessarily some clinical differences in the characters and course of the acute attacks, differences which may also be noticed in the period between the relapses. We will describe successively these two phases of chronic appendicitis.

a. The relapse.—We need not dwell at length on the symptomatology of the relapse. In fact, it does

not essentially differ from that of one of the forms of appendicitis which we have described. It may be purely appendicular; it may be peritoneal; it may be suppurative.

The first two forms are the most frequent. They correspond either to an intermittent distention of the appendix by mucus or to the temporary engagement of a scybalum, or to an acute attack of plastic peri-appendicular peritonitis.

In the first two alternatives, the symptoms are those of simple parietal appendicitis with appendicular color. The attack, which is sometimes of extreme violence, sometimes mild and characterized only by dull pains most felt in the right side, is followed by a fixed pain in the right iliac fossa, with a certain degree of resistance of the abdominal wall at this point. This resistance yields at the end of several days, and on exploring the region the physician may ordinarily feel, when the appendix is not deviated backwards or too far inwards, an elongated mass of the size of the thumb or index finger, which clearly gives the sensation of the distended appendix. This painful elongated tumor may remain perceptible in the interval of two crises, though it notably diminishes in volume. Whenever this can be felt, we are certain that the patient is not fully recovered and that he is exposed to a new attack.

The duration of each relapse of this moderate type

hardly exceeds eight or ten days. But the crisis may be shortened or aggravated, though remaining strictly appendicular, and take on either the painful purulent form, with appendicular colic, or the pseudo-peritoneal form with intense peritonism, as we have indicated above (see paragraph 17).

The following observation, which we borrow from Treves, will give a sufficient idea of this ordinary form of recurrent appendicitis.

A man, aged 44 years, entered the hospital in May, 1890. He had been sick since April, 1889. Previously his health had been perfect. He was a vigorous man, never having suffered from dyspepsia, and his intestines had always regularly performed their functions.

In April, 1889, he was taken with abdominal pains without appreciable cause. These pains gradually increased and soon he presented all the characteristic signs of an appendicitis—distention of the abdomen, repeated vomitings, constipation, painful tumefaction of the right iliac fossa. This attack terminated happily. But since then he had not ceased to have new attacks at intervals of five or six weeks. The acute period of each relapse lasted from five to seven days. After the cessation of acute symptoms, he entered upon a period of slow convalescence, but before he could call himself entirely cured a new attack supervened.

This man had not been able to work for thirteen

months. The most rigorous precautions could not prevent the repetition of the relapses. These relapses seemed to increase in gravity, and the patient had become a valetudinarian. He naturally had the fear of a new attack, and he had come to believe that he could not survive another. The day before the operation there was discovered in the right iliac fossa, on palpation, a little above and outside of Poupart's ligament, an appendix very much dilated.

The next day the appendix was excised; it was twisted on itself, very much deformed and distended so as to form a rounded mass. The operation presented no difficulty; the recovery was speedy and uninterrupted, and five months afterwards the patient was found to be in good health.¹

The peritoneal form differs from the preceding only in the greater intensity of the local symptoms, due to the propagation to the surrounding serosa of the appendicular inflammation, and to the greater duration of the acute attack. I need not repeat what I have said of this form of appendicitis with partial plastic peritonitis.

These are the two principal aspects under which the relapses occur. The *suppurative* form is much more rare. But I cannot admit with Treves that "when an abscess forms and the patient gets well, he is no longer exposed to other attacks."

¹Treves. *The surgical treatment of typhlitis*. Wood's Monographs August, 1891.

We have above cited a case where a little juxta-appendicular purulent focus gave rise, in a year and a half, to nine relapses. It is true that in this case none of the relapses ended in the formation and evacuation of a real purulent collection.

I have seen, in consultation with Dr. Juhel Renoy, another patient who in a year had four attacks of appendicitis. Each time the attack ended by the formation of an abscess in the iliac region, which pointed above Poupart's ligament, and which each time necessitated a surgical operation, giving vent to a great quantity of horribly fetid pus.

Treves says that the evacuation of the pus probably occasions the suppression of the veritable cause of the suppuration, the fæcal concretion being evacuated with the pus, or the appendix, seat of the lesion, being destroyed by gangrene.

It may be seen, by our first observation, that the suppuration may not be sufficiently intense to burst externally, or to indicate the necessity of bistoury, and that the fæcal concretion may remain imprisoned in the false membranes. It is seen in the last case which I have cited, that the repeated evacuation of the abscess does not necessarily bring to the surface the cause of the suppuration, since on four occasions the purulent collection formed again under the same conditions.

b. Intermediate period.—The acute crisis being at an end, the patient tends gradually towards health. But

he never recovers completely. When the appendicitis is purely parietal the remission may appear complete after the first two or three attacks, the intestinal symptoms remaining inconsiderable and the general state being satisfactory.

But from the third or fourth relapse, often earlier, the patient continues to suffer, and certain local signs persist, which the physician may find by searching if the patient does not speak of them, and which at last tell gravely on the general health.

Vague abdominal pains, frequent colics, occasional distention of the abdomen, painful digestion, a sense of discomfort in the right iliac fossa showing itself when fatigued, when walking, when lifting, etc., alternations of constipation and mucous stools—such are the principal symptoms which the patient complains of.

The exploration of the iliac fossa reveals a fixed focus of pain, which is aggravated and intensified by pressure of the finger, over the middle of a line extending from the umbilicus to the antero-superior spine of the ilium; and if the abdominal wall is strongly depressed, there is felt at this point a little elongated mass, more or less sensitive, which rolls under the finger, and which is the thickened and dilated appendix.

But the most important consequences of chronic appendicitis, whether the inflammation be only parietal or whether the appendix be imprisoned in

peritoneal adhesions, affect the functions of the cæcum and large intestines; so that it may be said that, if the relapse is chiefly appendicular, the intermediate period is rather cæcal or at least intestinal.

The inflamed appendix, in fact, acts as a foreign body, irritating not only the peritoneum, which is in a constant state of threatened inflammation, but also the large intestine, whose troubles may be of a catarrhal or mechanical order.

Indeed, the repeated relapses end by bringing on more or less rapidly, sometimes, a marked atony of the cæcum, sometimes a chronic irritation of the mucosa of the cæcum and of the colon.

1. *Atony of the cæcum.*—Cæcal atony implies a paretic condition of the muscular layer. This paresis may be explained in several ways: by nervous exhaustion, consecutive to repeated excitations of the appendix, or, in accordance with the law of Stokes, to the paralysis of the muscular planes subjacent to the inflamed serosa or mucosa. Whatever may be the true cause, the muscular atony of the cæcum manifests itself either by stagnation of the fæcal matters in this part of the large intestine, a stagnation which may amount to a real stercoral engorgement, or, as is generally the case, by gaseous distention of the organ.

Whatever the old writers may say, an isolated stercoral engorgement of the cæcum giving rise to a clearly defined cylindrical tumor is a rarity. But if

this stercoral tumor really ever exists, it is for the most part in relapsing appendicitis that it will be observed. Yet, doubtless, even in relapsing appendicitis, this stagnation of fæcal matters is very rarely sufficiently pronounced to give one a clear sensation of a cæcal tumor. The stercoral tumors are oftener seated in the left iliac fossa, or in the transverse colon.

Gaseous dilatation is much more frequent. It manifests itself by an exaggerated tympanitic sonorousness in the region of the right iliac fossa, often accompanied by gurgling sounds which may be elicited by pressure. I once saw a patient affected with recurrent appendicitis in whom the gaseous distention of the cæcum presented particular characters. In the interval of the acute attacks the belly remained painful to pressure, especially on the right side; on pressing deeply a very marked gurgling sound was heard, then at the end of a few seconds a soft tumor was seen to form in the right iliac fossa, swelling to considerable size under the finger; this tumor could be easily emptied by pressure, with a marked *glou-glou* sound. The patient, moreover, had remarked that this soft tumefaction had formed from time to time spontaneously; to cause its disappearance he had only to press strongly over his belly, when it would subside with a noise like that of pouring water out of a bottle.

2. *Chronic intestinal catarrh*.—The atony of the

cæcum ordinarily coincides with a greater or less degree of chronic irritation of the large intestine. We have now the symptoms of mucous colitis: dull, colicky pains, habitual distention of the abdomen, attacks of obstinate constipation, followed by diarrhœa and glairy and painful stools. It is not always easy to decide whether these intestinal troubles are anterior or posterior to the first attack of appendicitis. We have said that mucous colitis in numbers of cases must be regarded as a predisposing cause of inflammation of the appendix. What is certain, is that the signs of this colitis are observed chiefly in relapsing appendicitis in the interval of the crises.

In proportion as the relapses become more numerous, the consequences of these intestinal troubles increase in gravity. In certain cases, a chronic diarrhoea is established. No longer well nourished, suffering from bad digestion, tormented by continual abdominal pains, by irregular attacks of fever, these patients lose strength, grow pale and thin, take on an earthy hue and arrive at a state of intestinal cachexia, which finally gives them the appearance of persons affected with tuberculous peritonitis or abdominal cancer.

C. General course of the disease.—Thus constituted by acute crises separated by intervals of relative calm, relapsing appendicitis is a disease of long duration, but how long it is hard to determine. Can it get well spontaneously or by medical treatment alone?

Must it necessarily end in cachexia or fatal exhaustion of the patient? May it end in a perforation which entails death? It is hard to give a positive answer to these questions, from the fact that the final result of all the cases published of late years is an operation, which, by removing the appendix, removes the cause of the accidents, and consequently cuts short the natural course of the affection.

It is quite possible that recovery may take place without surgical intervention, by a fibrous transformation of the appendix, which, under the influence of these repeated inflammatory attacks, is contracted, obliterated, and becomes a simple cord of cicatrical tissue.

On the other hand, we know of no case terminating fatally by cachectic exhaustion, although the reading of certain reported observations might warrant the presumption of such a termination, if the disease were left to itself.

As to the possibility of perforation, there exist two diametrically opposite opinions. Some declare that it is not common for a first attack of appendicitis to end in perforation, and that we ordinarily find in the antecedents of persons affected with perforative appendicitis the mention of one or more previous attacks of mild appendicitis. Others maintain that several attacks are a safeguard against perforation, and that the more frequent the recurrences, the fewer the chances of this fatality.

The first opinion is not tenable as a general rule. Fitz's statistics, which deal with 257 cases of perforative appendicitis, show only 28 cases, *i. e.* a proportion of 11 per cent., where less grave crises have preceded the fatal perforation. Kraft's statistics, the most favorable to this view, give only a proportion of 25 per cent. We must then admit that in at least 75 per cent. of cases, the first attack may be perforative.

But we must not lose sight of the fact that writers do not always make distinction between recurrence and relapse. And we have shown that in good nosology this confusion cannot be countenanced. We should no more confound relapsing appendicitis with the recurrences of appendicitis than relapsing typhoid with a recurrence of typhoid fever.

Certainly we note quite often in the previous history of a case of perforative appendicitis the existence of former attacks of simple appendicitis, but this is by no means generally the case, and it is noteworthy that precisely the gravest form, hyperacute appendicitis, most often supervenes in the midst of perfect health, with nothing to hint at the possibility of such a fatality.

In true relapsing appendicitis, every attack does doubtless give some guaranty against danger. The oftener the relapses, the less the probability of perforation. If the crisis is simply appendicular, each inflammatory attack tends to thicken the walls of the

appendix, to infiltrate them with fibrous tissue, and thus render them less likely to be a prey to the ulcerative depredations of microbes. If the relapses are due to outbreaks of peritonitis, the barrier formed by adhesions and plastic exudates is re-enforced each time, and if by chance a perforation does take place, it will not have any serious consequence, the appendix being well protected in its fibrous investments, walled off from the general peritoneum, and isolated from neighboring organs and tissues.

Relapses may, then, take place indefinitely, with no especial menace of perforation. The frequency, the interval, the intensity of the attacks are very variable. They reappear sometimes with a remarkable regularity, every three weeks, every month, every two months. At other times the intervals are longer. In certain cases the patient, after a series of crises, remains three or four months or longer without a relapse, then the attacks reappear.

The duration of an attack is about eight days, but it may be shorter, two or three days. In general the relapse is reproduced after the same type and this type is that of the initial attack. But the type may vary, and with crises of parietal appendicitis or of simple appendicular colic, there may be more intense attacks with acute outbreaks of partial peritonitis.

But if relapsing appendicitis has not the immediate gravity of perforative appendicitis, it none the less creates in the long run a morbid condition which

renders life unendurable. These incessant attacks, grafted upon a permanent disorder of the intestines, transform the patient into a miserable invalid, incapable of any continuous work. At last these patients, wearied and disgusted with opiates, revulsives and other medical means, which bring no effectual relief, will be impelled to seek of their own accord (as numerous recorded instances testify), benefit from a surgical treatment which promises a radical cure.

21. GRAVITY OF THE DIFFERENT VARIETIES OF APPENDICITIS.

We have indicated in connection with each form of appendicitis the respective gravity of the morbid accidents bearing relation to the progress, extension or localization of the appendicular or peritoneal lesions.

We have seen that there are mild forms, medium forms, and grave forms. What is the relative frequency of these different forms? It is difficult to say absolutely. If, however, we take account, not merely of the reported cases, which generally are cases of considerable if not of fatal severity, but of the impression given by daily observation, by hospital and city practice, we may boldly affirm that half of the cases belong to the mild forms, *i. e.*, to parietal appendicitis, complicated or not with a certain degree of partial fibrinous peritonitis. This

figure may appear exaggerated to surgeons, who ordinarily see only the medium or grave forms; but it will seem to be an under-estimate to many physicians. It cannot unfortunately be based on any authentic statistics, for the report of these light cases is not ordinarily published. Only one kind of statistics will be of real worth, viz: such as shall group together all 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.

In this respect, the three following statistics may serve as data, in spite of the absence of details. Guttman, summing up all the cases of perityphlitis treated at the Moabit Hospital since 1879, reckons 96, of which only five terminated by death. At the Friedrichshain Hospital, Furbringer in four years observed 120 cases of perityphlitis; there were 78 per cent. of recoveries, 12 per cent. of ameliorations and 10 per cent. of deaths.¹ Fowler at the Middlesex Hospital observed in 10 years 99 cases of appendicitis and perityphlitis; 84 got well, 15 died.² That is; in a total of 315 cases there were only 30 deaths. There remain 285 cases which got well. Grant that in these 285 recoveries, there were 80 or 100 cases

¹ Discussion at the Society of Internal Medicine, Berlin. *Berl. Klin. Woch.*, May, 1891.

² Discussion at the Clinical Society of London. *Brit. Med. Jour.*, March 7, 1891.

of suppurative perityphlitis which fortunately terminated either by spontaneous opening or by surgical evacuation of the pus, and we are making a large allowance for the benignity of suppurative peri-appendicular peritonitis. It is seen that there remain much more than half of the cases which can belong only to the mild forms, without perforation, or sup-puration.

This much being said respecting the general gravity of appendicitis, we will class the forms we have described in the following order of decreasing gravity:

1. Hyperacute perforative appendicitis;
2. Sub-acute appendicitis with insidious course.
3. Acute appendicitis with partial suppurative peritonitis.
4. Chronic relapsing appendicitis.
5. Parietal appendicitis with appendicular colic.

A. It may be said that the hyperacute perforative form, with diffuse peritonitis, is surely fatal and in a short time. Some cases of recovery after early laparotomy do not authorize a modification of this general prognostication.

Death is sometimes almost fulminant, 37 hours after the onset of the attack in a case of Earle.¹ Fitz reports in his statistics eight cases of death in the first 48 hours. It is rare that the patient survives the first week.

¹ Earle. *Chicago Med. Jour. and Examiner*, February, 1876.

The fatal termination must be attributed, in this form, either to the violence of the abdominal shock, or to the rapid septicæmia, or to the intensity of the diffuse inflammation of the peritoneum.

B. I place in the second rank of gravity sub-acute appendicitis. This form is serious by reason of the nature and extent of the lesions, and of the deceptive insidiousness of the course of the affection. By causing the physician to hesitate on the diagnosis, by delaying the summoning of the surgeon, this insidiousness permits the suppuration without obstacle to advance in depth and extent, to infiltrate the neighboring muscles and tissues, and to provoke formidable and fatal complications.

I have said that this form corresponds most often to perforation of the appendix in the retro-cæcal tissue outside the peritoneum. I cannot admit the old notion which makes of cellular perityphlitis, of peri-cæcal phlegmon, the most benign form of the perityphlites. Preferable would be a peritoneal perforation—on condition, of course, that the peritonitis be limited and that the purulent collection become encysted—for there is much more chance of early interference in time to evacuate the pus, than in a case of extra peritoneal perforation, the ravages and often fatal consequences of which one can neither foresee nor prevent.

C. The third place I assign to perforative appendicitis with frank acute course, ending in eight to

fifteen days in the formation of an encysted purulent collection in the iliac fossa. It is this form whose treatment has profited especially by the exact knowledge of the cause and true seat of the lesions formerly attributed to inflammation of the cæcum. The opportune intervention of the bistoury must more and more limit its gravity. It suffices to read the observations of appendicitis treated by an early operation to be convinced of this. Without doubt, surgery cannot pretend to effect a certain cure in all cases. But if failures are sometimes due to unexpected complications, one can also often refer responsibility for failure to an operation too long deferred or incomplete.

Besides, this acute form terminates favorably in a certain number of cases, without surgical help, spontaneous evacuation of the pus taking place externally, either through the cæcum or the rectum. Old observations of perityphlitis prove this. In what proportion is this mode of cure observed? It would be important to ascertain accurately and to compare this proportion with that which surgical interference gives. Unfortunately the statistics ordinarily lump together indiscriminately, cases most unlike, from hyperacute to simple appendicitis. We may, however, compare the statistics of Bull and Noyes, which seem to pertain only to suppurative perityphlitis. In 67 cases of perityphlitic abscess left to themselves, Bull, in 1875, noted but 35

recoveries, or 52 per cent. In 100 cases of perityphlitis treated surgically, Noyes, in 1882, observed 85 recoveries.

As to spontaneous resorption of the purulent collection, we have no faith in such a result, although certain facts (Furbringer, Roux) seem to indicate the possibility of it; in any event the demonstration seems to us a matter of great difficulty.

D. Chronic relapsing appendicitis is rather an infirmity than a malady menacing to life. The progressive thickening of the appendix or the protective adhesions which are formed around it, limit and almost destroy the chances of a perforation. But the repetition of attacks, the intestinal troubles which persist in the intervals of the relapses, the cachectic state which finally takes possession of the patient, are facts which make the prognosis doubtful.

E. As to simple parietal appendicitis, it is a troublesome affection, because the possibility of a perforation necessarily haunts the mind of a physician. But when limited to the walls of the appendix, and even when complicated with a certain degree of fibrinous peritonitis, it always gets well by medical means. From the point of view of future welfare, one cannot help foreseeing the possibility of a recurrence, or the transformation of this first acute attack into a chronic relapsing appendicitis.

This scale of gravity enables us to establish the proper prognosis of appendicitis under its different

aspects. The other elements of appreciation are common to it and all other diseases: the age of the subject, his degree of resistance, the existence of general or local diseases, previous or actual, etc. These considerations are always matters of less importance than the form of the affection itself.

As regards age, the most that we can say is that in infancy the hyperacute perforative and the acute form with frank course are most commonly observed. In the child, appendicitis also quite often determines without perforation an extensive fibrinous peritonitis with violent symptoms, which easily gets well under medical treatment. In old age, on the contrary, when appendicitis is rare, perforation ordinarily takes place noiselessly and during the course of a disease that has pursued a very insidious course. Therefore, not only by reason of age, but also by reason of the appendicitis itself, the prognosis is very grave. This finds confirmation in the statistics of Einhorn, who demonstrates the frequency of fatal perityphlitis after 60 years of age.

In regard to coexistent maladies, the frequency of tuberculosis, reservation being made of true tuberculous typhlitis, is to be noted. It does not follow that every appendicitis supervening in a subject whose apices are suspected, is necessarily tuberculosis; it may be absolutely independent of the pulmonary lesion and get well like an ordinary appendicitis. But it is also possible that the lesion of the

appendix serves as a focus of attraction to peritoneal tuberculosis; and on the other hand, by acting as a cause of depression and bad nutrition it may favor the extension of pulmonary localizations.

Lastly, appendicitis which supervene in convalescence from acute diseases, typhoid fever, pneumonia, etc., are in general of an unfavorable prognosis. They ordinarily take the subacute form; the purulent inflammation takes place in an almost latent manner, and when there is no longer any doubt concerning the diagnosis of the affection it is generally too late to interfere.

V.

THE ERRORS OF DIAGNOSIS.

The diagnosis of appendicitis does not generally present any difficulty. The ordinary clinical type is as easy to recognize as that of acute pneumonia. The suddenness of the onset, the pain in the right iliac fossa, the localized tumefaction of the cæcal regions are as characteristic as the violent chill, the pain in the side and the rusty expectoration of common pneumonia. Without doubt the deviations from the type may lead one into error, but this is the same in all diseases.

The disputes raised by the surgeons are explained by the fact of their late summons to the bedside of the patient. At this moment, the phenomena of the onset are forgotten or misinterpreted, and what chiefly attracts attention is the swelling in the iliac fossa, with intermittent febrile state and gastro-intestinal troubles. In the form with slow course, where the purulent collection develops insidiously, the diagnosis is at times still more obscure. Moreover, the disputes of the surgeons generally pertain less to the diagnosis of appendicitis than to the question of the presence or absence of a purulent collection in the abdomen.

But in the acute forms with rapid progress, only those find any real difficulty who, holding to the

notion of the old typhlitis insist on the presence of the elongated cylindrical tumor which to them represents the inflamed cæcum, or who, finding a painful resistance in the right iliac fossa, can see there only the cæcum packed with fæcal matters, and do not understand that in the immense majority of cases they have to do with a limited peritonitis consecutive to a perforation of the appendix.

As for the hyperacute form, I maintain that the diagnosis is as simple as that of pneumothorax. Whenever in a child or adult habitually enjoying good health you notice the signs of acute peritonitis, you have reason to believe that there has been a perforation of the appendix. If the signs of this peritonitis have been preceded by a violent attack of colic with a fixed painful point in the right iliac fossa, you are warranted in affirming perforative appendicitis. This is really no new rule, for as early as 1853 Forget said that in presence of a primary peritonitis, without appreciable determining cause, one ought to consider perforation of the ileo-cæcal appendix as very probable.¹

It cannot but be, however, that grave mistakes of diagnosis have been made and will continue to be made. It is important to signalize the principal liabilities to mistake.

The true interpretation of the facts may be falsified:

¹ Forget. Peritonitis by perforation of the ileo-cæcal appendix. (Gaz. Med. de Strasburg, 1853, p. 321.)

1. By the initial painful crisis;
2. By the phenomena of intestinal paralysis and obstruction;
3. By the general symptoms;
4. By the tumor;

This represents, so to speak, the differential diagnosis of appendicitis. These causes of mistake being avoided, and the appendicitis recognized, it remains to determine one point which is a capital one for purposes of treatment, viz: if the appendicitis is perforative or not.

22. THE PAIN.

This cause of mistake belongs only to the first two or three days of the disease. It will not be likely to give any trouble to the surgeon, who is seldom or never witness of that first phase which we call appendicular, while interesting especially the physician who is called either during the course or on the very first day of the colic, and who ought to be able to decide as to the origin and nature of this attack.

The description which we have given of appendicular colic is sufficient to indicate how for lack of attention it may be confounded:

1. With an attack of hepatic colic;
2. With an attack of nephritic colic;
3. With an indigestion;
4. With a painful crisis of membranous enterocolitis.

a. Hepatic colic.—It is surely easier to indicate on paper the differential characters of these two kinds of colic, hepatic and appendicular, than to recognize these differences at the bed of the patient. Paroxysmal pains, vomitings, syncopal anguish, pinched features are symptoms which are the same in both cases. In hepatic colic the pains are rather stomachal, under the form of epigastric constriction, cramps of the stomach; the vomitings are more frequent, more obstinate. In appendicular colic the pain is rather intestinal, sub-umbilical or peri-umbilical; there are generally but one or two vomitings of food. The hepatic pains radiate upwards towards the shoulder, backwards towards the point of the scapula; the sensibility is extreme under the lower ribs, and the fixed painful point is just over the gall-bladder. In the appendicular pain, these higher irradiations are wanting, the painful paroxysms seem to converge towards the umbilicus and follow the course of the large intestine. The fixed point is in the right iliac fossa.

But on the one hand, if you are present during the attack, it is not easy, in the midst of the sufferings in which the patient is writhing, to get him to indicate these shades with precision; on the other hand, when the attack is over, nothing is more difficult than to give an exact description of a painful sensation, and it is not at all easy to obtain from the patient the detail of differences which perhaps are oftener more theoretical than real.

Hence, then, if it happens to be a first attack of the kind, and if there is nothing present but the appendicular colic without consecutive appendicitis, one will remain almost necessarily in doubt. If, on the contrary, the attack has been preceded by other similar crises, the diagnosis will be arrived at by eliciting the phenomena which have followed some one of the previous attacks: icteric tint, gastric troubles, in the case of biliary lithiasis—persistence during several days of the right iliac pain, in the case of appendicular colic. It is rare, indeed, that the appendicular attacks are repeated without being followed, at one time or another, by a certain degree of appendicitis.

When the appendicular colic is only the first phase of acute inflammation of the appendix, the mistake will not be continued, for the iliac pain, the determination of Mac Burney's point, the rigidity of the abdominal muscles over the cæcum must, in 24 hours, lead to a decision as to the veritable nature of the accidents.

It is, however, necessary to know that *calculous cholecystitis*, while having its maximum painful point under the costal border, may provoke irradiations all along the ascending colon, and, according to Potain, even have an extension to the right iliac fossa. These cases are, however, very rare, and, as Maurin observes, calculous cholecystitis is an affection which is chiefly observed in old age, when appendicitis, on the other hand, becomes exceptional.

6. *Nephritic colic.*—Mistake is still easier in nephritic colic. Like appendicular colic, its pain radiates downward, towards the groins and testicles, and often gives rise to tenesmus and to desires to go to stool; like nephritic colic, appendicular colic may cause retraction of the right testicle, frequent desires to urinate, a certain degree of oliguria with painful micturition. I know of a case where the mistake was committed and maintained with strange obstinacy by a group of distinguished physicians and surgeons; the patient succumbed the fourth day; the autopsy revealed a perforated appendix with suppurative peritonitis. But just as in hepatic colic, it is not likely, unless under very extraordinary circumstances, that the mistake will be continued beyond 24 hours, when the appendicitis follows the attack of colic. The localization of the signs in the right iliac fossa should not allow an attentive physician to be deceived longer about the true diagnosis.

c. Indigestion.—If the initial painful crisis is of great intensity, the presumption will generally be in favor of either nephritic or hepatic colic. If the abdominal pain is, on the contrary, of little violence and resembles a simple intestinal colic, it will be likely to be confounded with indigestion. It is most often after a copious meal or after eating some indigestible food that appendicitis suddenly manifests itself, and the first effect of the intestinal pain is to make the patient vomit up the food contained in the

stomach. In fact, it is by an indigestion that the morbid scene begins; the delicate point is to distinguish from a simple indigestion this indigestion which is symptomatic of an affection that is sometimes fatal in 48 hours.

I do not see, especially when the patient is a child incapable of locating the seat of his sensations, the means of avoiding mistake in the initial period. But the phenomena of a simple indigestion are ordinarily not prolonged beyond several hours. Seeing the accidents persist, the pain localize itself on pressure, the belly retracted or tympanitic, the pinched features, one will be warranted in suspecting appendicitis. It will not do to allow oneself to be deceived by the period of apparent calm which sometimes follows the first crisis of appendicitis, and which precedes perforation. In too soon forming a favorable conclusion from this period of lull and venturing a prognosis of little gravity, one runs the risk of being cruelly undeceived, in finding 24 hours afterwards the patient suffering all the signs of a generalized peritonitis.

d. Muco-membranous entero-colitis. — Glairy or membranous colitis often gives rise to crises of colic which resemble appendicular colic. Here mistake may be made in two ways: either by supposing an appendicitis to be present which does not exist, or by diagnosticating a mucous colitis when the real trouble is appendicitis with consecutive intestinal

atony. The confusion is the easier, because the suddenness of the onset, as well as the exciting causes (cold, fatigue, errors in diet, constipation), are the same in both cases. Besides the general course of colitis with its intermittent crises is very similar to that of chronic appendicitis with its successive relapses. Lastly, it should be remembered that glairy colitis does not exclude appendicitis, and that often it exists first and favors the production of appendicitis; the muscular and secretory atony of the large intestine being in my opinion the most common cause of the formation of the stercoral balls which are deposited in the cæcum.

In these cases it is the attentive exploration of the abdomen, and the exact determination of the seat of the pain which will decide the question of diagnosis. Mac Burney's painful point, accompanied by a muscular contracture localized in the right side of the abdomen, suddenly succeeding a crisis of colicky pains more or less general, belongs only to appendicitis. In colitis the pains are and remain diffuse, and if they tend to become localized in a point painful to pressure, it is generally on the left side, over the descending colon and sigmoid flexure, that this fixed point is noted.

The general sensibility of the abdomen, the phenomena of peritonism, the glairy stools, the propagation of the irritation to the bladder, a fever more or less marked, may be observed in both affections.

The tenesmus with sanguinolent stools or stools containing membranous debris, the temporary but complete lull after this expulsion of membranes or after a dose of castor oil which brings away a large quantity of hardened fæces, are rather symptoms of colitis than appendicitis.

e. Abnormal seat of the fixed pain.—The rule is that the appendix is found in the right iliac fossa, and consequently that the fixed and limited pain complained of by the patient and provoked by the pressure of the finger, occupies this region. But we know that the appendix, normally or by reason of previous adhesions, may undergo divers deviations, sometimes to the left, sometimes backwards, sometimes inwardly against the psoas muscle.

In these conditions the deviation of the painful point may give rise to mistakes. Routier has reported a case where a hyperacute perforative appendicitis began by a sudden pain in the left hypochondrium. Peritonitis by perforation was diagnosed; but the idea of appendicitis was rejected by reason of the left-sided seat of the pain. Nevertheless, the autopsy showed the appendix perforated at the point, with a fæcal ball imprisoned in its middle.¹ Fränkel, in the discussion raised by Sonnenburg at the Society of Internal Medicine of Berlin, says that he has observed a case where all the phenomena of

¹ *Semaine Medicale*, August, 1891.

appendicitis were produced in the left iliac fossa, the right being absolutely normal.

On the other hand, in case of posterior deviation, the pain may be referred to the right lumbar region; one would then be inclined to attribute the symptoms to a lumbo-abdominal neuralgia or to a perinephritis.

Lastly, Gibney has pointed out the possibility, especially in children, of confounding a perityphlitis with a coxalgia. He reports a case where the first symptom complained of was a pain in the right hip. In five other cases the attitude of the patient was that of the coxalgic: thigh bent on the pelvis, pelvis inclined to the right, lordosis very marked. In these cases Gibney noted a tumor in the right iliac fossa, which twice only suppurated. Although Gibney admits the existence of a primary perityphlitis, he fully believes that he had to do, in the cases of which he writes, with appendicitis with peri-appendicular inflammation; the appendix being deviated inwardly and into direct relation with the psoas and iliacus whose contracture produced the painful flexure of the thigh.¹

¹ Gibney. Perityphlitis in children, illustrating points in the differential diagnosis of hip diseases. *Amer. Jour. of Med. Sci.*, January, 1881, p. 119.

23. PHENOMENA OF INTERNAL STRANGULATION.

The symptoms of intestinal paresis, which in the mild forms of appendicitis manifest themselves by a more or less obstinate constipation, attain sometimes such a degree of intensity when the perforation takes place into a peritoneum perfectly healthy, that the aspect of the patient resembles that of an individual affected with internal strangulation.

The violence of the abdominal shock immediately produces collapse, with general coldness, cyanosis, arrest of the urinary secretion and peristaltic intestinal movements. The paralysis of the intestine is so complete that neither fæces nor flatus is passed, and fæcaloid vomitings are observed. The belly, more or less tympanitic, is hard and tense as a drum.

In these conditions which are met only in hyperacute appendicitis with general peritonitis, the mistake has often been made and laparotomy performed for an internal strangulation.

Ransohoff published 12 cases of appendicitis where the symptoms were those of strangulation. Hartley has seen two cases where an operation for strangulation was performed. the symptoms of obstruction were found due to a gangrenous appendix.¹

Peyrot has reported similar cases.²

Moreover this confusion with internal strangula-

¹ (N. Y. Med. Rec., Aug. 16, 1890.)

² *These d' agreg*, Paris, 1880.

tion is not special to appendicular peritonitis. Every peritonitis by perforation, whatever may be the origin of the perforation, may produce it, and the similarity of the symptoms is such as to deceive the most expert clinicians, just as in the cases of Henrot's patient where the abdominal lesions was supposed to be internal strangulation, and the autopsy showed perforation of the gall-bladder with general peritonitis.

The mistake is of less consequence to-day since the indication for laparotomy is the same in both cases.

The principal differential characteristic is the state of the temperature; so say various writers. "The temperature," says Peyrot, "always rises in peritonitis; it often attains 39° C. and even 40°. In strangulation, on the contrary, the temperature falls or at least does not exceed the normal, and if hyperthermia supervenes, it is because there is a complication of peritonitis." This is true in a general way; but this character is absolutely illusory in a case where, by reason of the intensity of the abdominal shock, the peritonitis by perforation resembles strangulation most closely. In these cases, not only there is no rise of temperature to 39° or 40° C., but the temperature remains normal or even sub-normal, as in the case which I have reported of a young woman affected with perforating ulcer of the stomach. In my opinion the true differential sign is furnished by an

examination of the abdomen. In strangulation there is always very pronounced meteorism. In the cases of hyperacute peritonitis by perforation where the symptoms of strangulation are most marked, the belly is not distended; it is, on the contrary, rather excavated, hard, tense, being rendered rigid by the contracture of the abdominal muscles.

There exist, however, cases in which the study of the temperature has great value and becomes an excellent means of diagnosis; it is when the symptoms of obstruction coincide with an appendicitis which has given rise, not to a general peritonitis, but to a localized suppurative peritonitis or abscess. In these conditions, whether the obstruction be due to a reflex paresis of the large intestine, or to the compression brought to bear on the colon by the purulent collection, the existence of a remittent fever with evening exacerbations, the attentive observation of course of the disease, its mode of onset, the previous history etc., should put the physicians on the right track and indicate the cause of the obstruction.

One of the varieties of internal strangulation, ileo-cæcal invagination, might in particular, according to Reclus, be confounded with appendicitis. It gives rise, in fact, to a severe pain followed by a tumefaction which often occupies the right loin, to digestive and peritoneal troubles, to symptoms of occlusion which remind one of perforation of the appendix. Reclus gives as a differential character of the invagi-

nation, the less sharp and more localized pain, the rare and less early fever, the later and more obstinate vomitings, the existence sometimes of bloody stools, finally the fact that the seat of the tumefaction is not absolutely the same.¹ These characteristics appear to me very vague.

It were better to say that invagination is a rarity and to recognize that it is well nigh impossible to diagnosticate it with certainty.

24. THE GENERAL SYMPTOMS.

The febrile symptoms, in the acute forms, the cachectic aspect, in the subacute and chronic forms, may lead into error, in certain cases, and cause the physician to suspect sometimes a typhoid fever, sometimes a tuberculous peritonitis.

a. Febrile state.—The fever is rarely very high in appendicitis. It sometimes happens, however, that it rises in the first days to 39 and even 40° C. for a short time. Coupled with the gastro-intestinal troubles, with pain in the right iliac fossa, with the prostrated appearance of the patient, it has sometimes caused suspicion of an onset of typhoid fever. But one must needs be remarkably stupid to long adhere to such a diagnosis.

Even when high at the onset, the fever does not last, and falls at the end of two or three days; in any

¹ Reclus, *Des Appendicitie, Rev. de Chirurgie*, Oct. 1891.

case, the curve of temperature is absolutely irregular. The iliac pain in typhoid fever never shows the intensity of appendicular pain. Finally vomiting, as an initial symptom of typhoid fever, is rare.

b. Cachectic aspect.—Although subacute appendicitis may give occasion for mistake in diagnosis, when the suppuration takes place insidiously and noiselessly with accompaniment of remittent fever with evening exacerbations, it is especially chronic relapsing appendicitis which is liable to misinterpretation, being mistaken for tuberculous peritonitis. I know of a patient who, having already had two attacks of acute appendicitis, presented during the third such symptoms of intestinal cachexia with extreme emaciation, slight hectic fever, etc., that the physician in charge diagnosticated an entero-peritoneal tuberculosis; and such was his confidence in this diagnosis that he even believed himself to find at one time dry cracklings at the apex of one of the lungs. The patient finally got well at the end of five or six months, and for twelve years has never had any symptom pointing to the existence of pulmonary or peritoneal tuberculosis.

Relapsing appendicitis, especially when it exists in relation with the persistence in the vicinity of the appendix of a small pus-pocket, source of putrid infection, may give rise to a symptomatology which hardly differs from that of chronic tuberculous peritonitis. There is the same general aspect, with emaciation, earthy complexion, abdominal facies; the

same febrile accessions with evening intermittences, the same alternations of diarrhœa and constipation with distention of the abdomen, the same acute attacks with nausea and vomitings. A minute examination, an attentive interrogation, a prolonged observation of the subject, are necessary to arrive at a conclusion; and sometimes it is impossible to do this with certainty.

The fact is that the two things, tuberculosis and appendicitis, may co-exist, and such co-existence is not absolutely rare. From this point of view, it is necessary to distinguish three categories of cases:

1. The appendicitis is produced by the ordinary mechanism, traumatic or stercoral appendicitis, in a tuberculous subject, at any period whatever of the tuberculosis, without there being, properly speaking, any tuberculous lesion of the intestine.

2. The appendicitis is due to the propagation of a tuberculous entero-colitis to the appendicular mucosa, with specific ulceration of this mucosa, and finally perforation at the level of the ulceration. These cases are exceptional, and up to this time, very few observations of this kind have been published.

3. The appendix has no longer a causal relation; the lesions are situated in the cæcum itself; it is really a tuberculous typhlitis. The ulcerous inflammation of the mucosa has for its consequence a thickening of the cæcal walls with tuberculous peritonitis limited to the region, the whole forming a tumor more or less

clearly defined in the right iliac fossa. This tumor, joined with the duration of the disease and the cachectic condition of the subject, suggests cancer of the cæcum rather than appendicitis. Billroth has reported to the Imperial Society of Medicine of Vienna a case of this kind, which gave rise to accidents of obstruction; the diagnosis of cancer was made.¹ In one of Pilliet's cases² the autopsy showed the cæcum reduced to a sort of ampulla, of the size of a small orange, with thick and rigid walls, interposed between the two intestines. There was no longer any trace of the ileo-cæcal valve, and the appendix was represented only by a very small lateral cavity like the finger of a glove. Around the cæcum were a great number of caseous glands of the size of a bean or of a hazel-nut.

What the communication of Pilliet and Hartmann makes particularly prominent, is the special aspect of this form of tuberculous typhlitis. The lesions do not resemble ordinary bacillary ulcerations. There is a veritable granular proliferation, with hypertrophy of the mucosa, which conceals in part the ulcerated surface; it is a sort of villous papillomatous state, such as is found in certain cases of laryngeal phthisis, and which, to the naked eye, suggests the idea of cancer. But the microscope shows the histological lesions of tuberculosis.

¹ Billroth, Imp. Soc. of Vienna, Feb. 27, 1891.

² Pilliet and Hartmann. Note on a variety of tuberculous typhlitis resembling cancer of the region. *Soc. anat.*, July and Nov., 1891.

It must not be thought that all tuberculous typhlites answer to this type; in this case we are evidently concerned with a chronic process of very slow evolution. In other cases, of more rapid progress, the ulceration tends to perforate the cæcal walls, and there results from it a real suppurative perityphlitis, as in the case of the patient observed by M. Duguet.¹ In such a case if the tuberculosis is localized in the cæcum, if no signs of pulmonary phthisis exists, it is very difficult to avoid mistakes, and the diagnosis will almost necessarily fail to include the specific nature of the pericæcal suppuration.

We must compare with tuberculous appendicitis the still more rare cases of *actinomycosic* appendicitis, like that which Ransom recently communicated to the Medical and Surgical Society of London. The diagnosis can be made only after opening the abscess and by detecting in the pus the characteristic granula formed by the colonies of actinomycetes.²

25. THE TUMOR.

I doubt whether in acute appendicitis with limited peritonitis there can be any mistake about the tumor, if the disease has been followed from the onset. It is only in the case of a female that a mistake seems

¹ Duguet. Phlegmonous typhlitis in a case of tuberculous enteritis. *Gaz. Méd. de Paris*, 1870.

² Ransom. *Royal Med. and Surg. Soc.*, of London, April 16, 1891.

possible, or in the event of the physician being called at a late date, when the disease is fully developed, and there are insufficient, or misleading commemorative data.

It is chiefly in sub-acute appendicitis that the physician can be led astray by misunderstanding the slow, insidious and irregular course of the affection, on the one hand, and on the other, the abnormal localization of the purulent collection due to some one of the deviations of the appendix.

a. I am not going to repeat what I have said respecting cæcal or appendicular tuberculosis. But cancer of the ileo-cæcal valve sometimes produces symptoms which resemble sub-acute appendicitis, especially when it is complicated with gradual perforation of the intestinal walls, and with formation around the cæcum of purulent foci with fæcaloid pus. At an advanced period of cancer, the cachexia and cancerous anæmia, ordinarily very pronounced in malignant tumors of the ileo-cæcal valve, will enable one to recognize or at least to suspect the organic lesion back of the purulent complication.¹ But if this complication supervenes in the first phases of the cancerous affection, the mistake will be with difficulty avoided.

The converse, however, is also possible. A sub-

¹ Wacquet. Cancer of the cæcum with narrowing of the colon. Abscess of the iliac fossa opening into the gluteal region. Soc. Anat., 1846, p. 155.

acute appendicitis with adhesive peri-appendicular peritonitis without suppuration, supervening in a man who is past 40, may give rise to symptoms of emaciation, asthenia and general anæmia which, taken in connection with the finding of a more or less limited swelling in the right iliac fossa, and with the infrequency of appendicitis beyond 40 or 45 years, will almost necessarily make the diagnosis lean in favor of a malignant tumor in the ileo-cæcal region.

It is impossible to give precise rules to settle the question in such cases. As in tuberculous appendicitis it is chiefly a matter of attentive observation, minute and prolonged, and also of clinical acuteness and skill.

The mistakes due to abnormal location of the abscess are of two kinds: the one kind, common to both sexes, pertains to the not uncommon vertical deviation of the appendix behind the cæcum; the other, peculiar to woman, depends on the direction of the appendix downwards and inwards towards the pelvis.

b. The upward and backward deviation has for consequence the formation of a purulent collection in the lumbar region. Hence possible confusion with a *perinephritic* abscess. There are given as differential marks: the tendency of the peri-renal abscess to project backwards, the œdema of the dorsal region and the absence of pus or albumen in the urine. This is

a diagnosis of the study rather than of the clinic. In many cases of perinephritis, there exists no modification of the urine. On the other hand, a retro-cæcal abscess may cause œdema of the dorsal region and point in the back, and when left to itself, it sometimes opens into the lumbar region and leaves there a permanent fistula.¹ The truth is that here again only an exact interpretation of the commemoratives can help one to diagnosticate the origin of the pus. But I am much inclined to believe that a good many abscesses of the dorso-lumbar region are diagnosticated and opened as perinephritic abscesses, without even a thought that they may possibly be of appendicular origin.

When the appendix rises very high behind the large intestine, or when the inflammation is propagated very rapidly towards the infra-hepatic region, a less frequent consequence of this posterior deviation is to divert the attention from the appendix and lead the physician to believe that there is an affection of the liver or of the gall bladder. The following observation of W. W. Keen is instructive in this particular:

A young woman aged 30 years was suddenly taken with violent pains below the right costal margin. The next or the third day one of her children acci-

¹ Mending, Lumbar fistula communicating with the cæcum, coming on after inflammation and suppuration of the neighboring parts; recovery. *Arch. gen de med.*, 1842.

dentally struck her in the same region, producing a sharp pain. Five days afterward the pains became extremely severe and the patient fell into such a state of collapse that her physician thought she was going to die. The temperature was below 36° C. A powerful stimulant revived her, but the pain continued. Another collapse took place the eighth day, with coldness of the extremities; it was then that Dr. Keen was called in consultation.

The thigh was flexed, the right side of the abdomen extremely sensitive, with marked tension of the muscles; the least contact produced a sharp pain. On the left side a moderate pressure was tolerated. The pain was located exactly below the inferior border of the liver, diminishing progressively towards the right iliac fossa. Nothing was noted on the part of the uterus and its annexes. An exploratory laparotomy was decided upon for the next day, as the diagnosis was hesitating between an appendicitis and an undetermined affection of the liver or gall-bladder.

On opening the abdomen, the left border of the liver was seen attached to the colon by recent adhesions, and the parietal peritoneum was strongly injected at this point. The gall-bladder was normal, also the kidney, no trace of abscess could be discovered, nor any cause of inflammation. The right iliac region and the cæcum presented no lesion, but the appendix could not be found. The intestines

were normal as well as the uterus and the ovary. There was a great accumulation of serosity in the right side. The abdomen was washed with warm water and closed without the cause of the morbid accidents being found. The patient died four days after the operation.

The autopsy revealed a perforative appendicitis. The appendix, of the length of three inches, ascended directly behind the cæcum and colon, being agglutinated to the wall of the large intestine, between the two folds of the meso-colon. Its extremity was perforated, and communicating with a little abscess containing hardly a spoonful of pus mixed with some faecal matters.¹

c. The downward and inward deviation of the appendix explains the difficulties of diagnosis of appendicitis in women. Descending towards the pelvis, the appendix is placed in direct relation either with the tubes, and especially the right, or with the uterus or the vagina. The encysted peritonitis which results from the perforation of the appendix in this position, is then confounded with the consequences of the lesions of the womb or its annexes. If we add to this that appendicitis is relatively rare in the female; if we reflect on the natural tendency to attribute to some alteration of the genital organs all the painful or inflammatory phenomena from which women suffer in the region of the pelvis, it will be seen that the

¹ W. W. Keen, Philadelphia Medical Society, Sept. 28, 1891.

mistake is quite easily made, and it may be that appendicitis appears to be so rare in the female only because it is not diagnosticated.

A woman entered the service of Richelot¹ with all the signs of salpingitis, or at least of a lesion of the annexes, sensibility to the touch, tumefaction giving to the vaginal touch the sensation of a dilated and inflamed tube, severe pains, difficulty in walking. Laparotomy was practiced, and the appendix found increased in size and adherent to the ovary and right tube. The appendix was isolated and resected; it contained a little parietal abscess but no foreign body. The left ovary was cystic. The intimate fusion in certain cases of the appendix with the tubo-ovarian annexes is not likely to facilitate the distinction between the lesions of the two organs.

It is with pyosalpinx that the confusion is without doubt oftenest made. But the two observations of Burke prove that hæmatocele may also be one cause of mistake. One of his cases was a hæmatocele, ending fatally in 48 hours; the diagnosis of perforative appendicitis had been made. In the second a hæmatocele had been diagnosticated and the autopsy showed a perforated appendix with gravid uterus. The coincidence of pregnancy is not likely to facilitate diagnosis. Oppenheimer observed a woman who,

¹*Bull. Soc chir. Oct. 15, 1890.*

at the seventh month of pregnancy, was taken with bilious vomitings, irregular fever, swelling of the spleen, without very marked pain in the belly or appreciable tumor in the right iliac fossa. Three days after she gave birth to a child who soon died. The fever continued; then at the end of several days there appeared in the right loin a voluminous tumor, large as the head of a child; it was thought to be a renal tumor. The patient succumbed rapidly. At the autopsy a perforative stercoral appendicitis was found; the appendix was situated behind the cæcum, and the perforation was in the retro-cæcal tissue; the pus had burrowed along the kidney and between the two folds of the mesentery to the retro-peritoneal space; there were metastatic abscesses in the liver and spleen.

In a patient of Welch's an extra uterine tubal pregnancy has been diagnosticated. Three weeks after her entrance into the hospital, the sac burst into the peritoneum and there was a profuse hæmorrhage. The bloody liquid, removed from the peritoneal cavity by aspiration, gave a pure culture of the *bacterium coli commune*. Welch concluded that there must have been an intestinal perforation. There was no other sign pointing to appendicitis. Laparotomy was attempted, but the patient died in the operation. At the autopsy, appendicitis with general peritonitis was found. There was a right-sided tubular pregnancy

with rupture of the sac, to which the perforated appendix was adherent.¹

26. DIAGNOSIS OF THE FORMS OF APPENDICITIS.

The causes of mistake being avoided and appendicitis recognized, an important point still remains to be diagnosticated, *i. e.*, the form of the appendicular inflammation; is it parietal or peritoneal, fibrinous or purulent, simple or perforative? We have seen that the prognosis depends almost entirely on a correct decision on these matters. It is the same with the treatment. The problem, in short, is summed up in these two questions:

Can it be said that an appendicitis *will be* perforative?

Can one recognize whether an appendicitis *is* perforative?

A. The first question is encountered at the very onset of the affection. It must be acknowledged that it is well-nigh insoluble. The only form of appendicitis in which one may foresee from the beginning the course of the disease, is chronic relapsing appendi-

¹ Oppenheimer. Discussion at the Society of Internal Medicine of Berlin. *Berlin Klin. Woch.*, May, 1891.—See also a fatal case of perforated appendicitis with diffuse peritonitis in a woman in the third month of pregnancy. (*N. Y. Med. Record*, Jan. 23, 1892.)

Welch. *N. Y. Med. Record*, Dec. 1891.—See also the case reported by Harrington (*Boston Medical and Surgical Journal*, Dec. 10, 1891), where the deviation caused the physician to diagnose a tumor of the ovary.

citis. Even here it must be added that it is only at the third or fourth recurrence that one can decide with any confidence, the perforation being less and less probable the more frequently the attacks are repeated. One must also remember that perforation may take place during the first or second recurrence, and only give rise to a small encysted abscess, and that later recrudescences are due to inflammatory outbreaks in the vicinity of this abscess.

But in the other varieties of appendicitis, on what data shall we rely to predict the mode of termination of the attack? The perforation is never immediate, we have already sufficiently insisted on this point. It is always preceded by what we have called the appendicular phase, during which the inflammatory process goes on, which may or may not end in the rupture of the appendix. This phase lasts 24, 48 or 72 hours. During all this time it is impossible to reach a decision. Neither the suddenness of the onset, nor the character or intensity of the pains, nor the presence or absence of fever, permit a conclusion in one way or the other. For the most acute symptoms may yield to leeches, to a hypodermic injection of morphine, without the inflammation passing beyond the walls of the appendix; and, on the other hand, the appendicular phase may be very quiet, with little pain, so that the signs of peritonitis by perforation seem the first indication of serious disorder.

However, this necessary reservation has no practical importance, apart from a few exceptional cases, like those published by certain American surgeons. In general, the patient does not consult the physician at the onset of an appendicitis; he believes himself to be suffering from simple colic or indigestion; ordinarily he takes a purgative on his own responsibility, and it is only at the end of two or three days that, seeing the pain persist or increase, he decides to summon the physician.

B. In fact the true difficulty is in knowing whether the perforation exists or not. Now it may be said that by the third or fourth day, in the immense majority of cases, this difficulty hardly exists.

At this moment one either observes or does not observe the signs of an acute peritonitis, partial or general.

If they are not observed, *i. e.*, if there is neither extreme pain over the abdomen on pressure, nor tympanism, nor repeated vomitings, nor hiccough, nor pinched features, nor high fever, there are at least five chances out of ten that the appendicitis is and will remain simply parietal.

There are, however, cases in which, although the signs of acute peritonitis are wanting, the perforation none the less takes place, either into a very restricted space, walled in by adhesions, or into the extra peritoneal cellular tissue.

Here it is only the attentive exploration of the iliac

fossa which will enable one to decide, and often the retraction and tension of the abdominal muscles render this exploration very difficult. In general, however, a more or less well-defined swelling is perceived, either deep down in the iliac fossa, or higher up and external, above the antero-superior spine of the ilium. This last location, in connection with the absence of peritoneal phenomena and the obscurity of the general or functional symptoms, should lead one to suspect a perforation into the retro-cæcal cellular tissue. One must take care in this case to avoid the tendency, perpetuated by the old notion of stercoral typhlitis, to attribute this elongated swelling to a simple fæcal engorgement of the cæcum.

If the signs of an acute peritonitis, general or partial, exist, there is hardly room for hesitation. Diffuse peritonitis is generally connected with the hyperacute perforative form. One sometimes, it is true, observes the symptoms of a peritonitis, at first general, becoming localized at the end of several days in the right iliac fossa; but that may be considered as exceptional.

If the peritonitis is partial and localized in the right loin, a new question presents itself: is the inflammation fibrinous or purulent? Is there or is there not a collection of pus?

I believe that it is almost impossible to decide with certainty during the first week. Without doubt, when the local signs are very marked, when the gen-

eral condition is very grave, when the fever rises to 39 and 40° C. and persists at this height, there is reason to believe that perforation has taken place with the usual purulence of the peritoneal effusion. But even these symptoms may be almost as well marked in some cases of pseudo-peritonitis or of local peritonism, so that absolute certainty is not always warrantable. Simple fibrinous peritonitis may at least for several days give rise to symptoms apparently as dangerous as a peritonitis purulent from the first.

All this would not matter much if we believed in the desirableness of an early operation in all cases; supposing that the diagnosis is not quite clear, the surgeon's scalpel will remove all the mystery. If however we believe in an operation only for the suppurative cases, we shall feel the necessity of being sure as to the presence of pus before we consent to a laparotomy.

It is impossible for us now to be satisfied with the signs which led the old surgeons to diagnose suppuration; local pain, sharp and throbbing, fluctuating tumor, attacks of intermittent fever. These signs indicate rather incipient infection of the organism than the processes of suppuration properly so called. To wait for these, is to leave the patient exposed to all the dangers which have from of old menaced the victims of perityphlitis, and which have brought an early operation so much into demand. It is certain that pus sometimes exists in perforative appendicitis

from the first forty-eight hours. It is absurd then to wait till the third or fourth week when the presence of a pus collection is no longer doubtful to the judgment of the most inexperienced physician; we ought the rather to assure ourselves as early as possible of the presence of pus that we may give it a free vent externally, in accordance with the old precept: *ubi pus, ibi evacua*.

Some American surgeons have recommended the exploratory puncture; Furbringer, Renvers, in Germany, also declare themselves advocates of this as a means of diagnosis, and consider it without danger. Treves, on the contrary, strongly opposes its employment, and Roux of Lausanne also condemns it, "because," he says, "this puncture is *sometimes dangerous, very often without result, and always useless.*"

I am absolutely of the opinion of Treves and Roux. I do not understand how the exploratory puncture can seem harmless to Furbringer. Let one consider that it is a matter of plunging a needle, sometimes three or four times, to the depth of three or four inches into the abdominal cavity, of pushing it blindly around in different directions in a region where the iliac blood-vessels are situated, as well as the ureter, the cæcum, and the intestinal coils more or less displaced and inflamed. The operation of aspirating an intestine which is only in a tympanitic state (as in the meteorism of typhoid fever-paralysis) is not without danger; how then can we suppose that

the puncture of an intestine whose walls are inflamed and softened can be devoid of harm? If the needle penetrates the cæcum or distended appendix, may it not produce a perforation which does not yet exist and which perhaps would not occur at all? On the other hand, suppose the needle, after having traversed the inflammatory focus, be thrust still more deeply, either into the walls of the iliac blood-vessels, or even simply into the sub-peritoneal cellular tissue. May it not inoculate these parts with the germs with which it becomes infected in traversing the morbid focus, and can one foresee all the possible consequences of such an inoculation?

If, at least, the exploratory puncture furnished certain and indisputable data, there would be more warrant for it, but a negative puncture does not prove the absence of pus. It is very evident that, if this means be employed, it is because the case is doubtful, the abscess therefore very limited or deeply located. In spite of three, four or more explorations, the needle may not happen to reach the pus cavity. This is not a gratuitous hypothesis. I can cite an observation of Bull, an advocate of the exploratory puncture, a surgeon very skillful and familiar with these peri-appendicular lesions, where several punctures gave no result, and yet a free incision made immediately afterwards evacuated four ounces of pus.

On the other hand, in numerous cases cited in its

support, the puncture was at least useless, for the incision made immediately after the needle had demonstrated the presence of pus, gave vent to so great a quantity of purulent liquid that one may confidently affirm that an attentive examination of the patient would have sufficed to reveal the suppuration, without the exploratory puncture with the trocar.

We can, therefore, only endorse the judgment of Roux, of Lausanne: "Exploratory puncture is sometimes dangerous, very often without result, and always useless."

This surgeon indicates another means of diagnosis, which, he says, never has failed him: "If the cæcum is shown to be empty of fæcal matters, either by the existence of spontaneous stools, or in consequence of purgatives or lavements, and one observes over this part of the large intestine a sensation of softish resistance, comparable to that which a cylinder of pasteboard gives when very soft and wet in warm water, one may be sure that pus exists. This special resistance, sometimes accompanied by a slight degree of dullness, is connected with the inflammatory infiltration of the cæcal walls, an infiltration which renders them somewhat rigid and in every case perceptible to palpation."¹

I cannot discuss the diagnostic value of this sign; it seems to me, however, that a simple, plastic,

¹ Roux. *Rev. Méd. de la Suisse Romande*, April, 1890.

non-suppurative inflammation, might perhaps determine the same infiltration and, consequently, on palpation give a similar sensation.

In fact in the acute forms with frank evolution, it is the attentive study of the course of the disease itself which gives the surest information. The extreme intensity of the symptoms of local peritonitis may in certain cases cause the medical attendant to suspect suppuration after the first four or five days, but even then it would be rash to affirm that the inflammation will not terminate by resolution.

In general, it is impossible to pronounce with certainty till after the seventh or eighth day. At this moment there takes place a lull in the general and febrile phenomena. This lull is complete and definitive, at least for some time, when the inflammation is simply fibrinous; the fever falls, the general state goes on improving each day. If, on the contrary, the peritonitis is suppurative, the lull is incomplete; the fever persists, no longer elevated and continuous but irregular, normal in the morning, mounting to 38.6° and 39° in the evening, accompanied by a general malaise, by a restlessness which may be subdued in the morning, but comes on again in the evening or in the night time. Hence it is desirable to watch the patients closely, to examine them several times in the day, not only to note these variations of the febrile state, but to appreciate the modifications presented by the local phenomena, the augmentation

of the tumor, the possible tendency to extension of the peritonitis.

After the eighth day one necessarily refers these symptoms of aggravation to the presence of a purulent effusion, and in the frankly acute forms, the temperature rises again towards the 10th and 12th day, which confirms the diagnosis of suppuration.

But it will not do to forget that there may be pus without any great febrile movement and even without any fever at all, that the signs of peritonitis may be scarcely marked, that there exist, in a word, cases with abnormal evolution, corresponding to the forms which we have classed under the name of sub-acute appendicitis. It is very rare here that the diagnosis can be made early; no rule can be laid down; and in order to arrive at the conclusion that there is a collection of pus, the medical attendant will rely on the detection of a deep swelling more or less well defined, and on the bad general state of the subject, his cachectic aspect, and the tendency to intermittent or remittent febrile accessions, etc.

VI.

THE TREATMENT.

As long as appendicitis was called typhlitis, and it was believed that the lesions were seated in the cæcum, the treatment remained almost exclusively medical. Indeed, it could not be otherwise, for no one would have thought of incising the large intestine. The surgeon was not called till the pus, after doing more or less mischief internally, came to point under the skin in some part of the abdominal wall, and then it was generally too late to save the patient.

We must, however, remember that 35 years ago Dr. Lewis, of New York, recommended an early incision. He had collected 47 cases of suppurative perityphlitis treated by the ordinary methods, with only one cure. He logically concluded that these methods were insufficient; that it was not necessary to wait till the pus collected and pointed in plain sight before operating, and that a free opening should be made as soon as the presence of pus in the iliac fossa was suspected.

Twenty years later, in 1875, another New York surgeon, Dr. Gouley, insisted on the necessity of early opening of the abscess to prevent its rupture into the peritoneal cavity or elsewhere. The incision should, he said, be made as soon as the symptoms become threatening and even before fluctuation is

manifest (as early even as the seventh or eighth day). He gave statistics of 25 cases of typhlitis occurring in England and America, which were treated by an early incision; of these there were 17 recoveries and eight deaths.

A more precise knowledge of the causes and seat of the suppuration, and the discovery that appendicitis is so often perforative, naturally gave impetus to the surgical treatment of the disease.

We have seen that as early as 1827, in his remarkable memoir on the diseases of the appendix, Melier had foreseen the part that surgical intervention was to play in the treatment of inflammations of the appendix. "If," said he, "it were possible to make a certain diagnosis of these affections, we should be able to save all our patients by means of an operation. Possibly the day will come when we shall be able to do this."

The prevision of Melier is to-day realized—we may even say exceeded, for surgeons have now attained such a degree of confidence that many (and I allude in particular to certain *American* surgeons) no longer wait for the indications formulated by the more conservative authorities, but propose an immediate laparotomy for every case that presents itself.

Naturally there has been a reaction against this zeal for the use of the knife. To the triumphant statistics of the surgeons, the physicians have replied by statistics no less decisive; for instance, those of

Guttman, where out of one hundred cases recorded as typhlitis and perityphlitis the medical treatment gave ninety-six (96) recoveries and four (4) deaths.

We do not believe that this question can be decided by an appeal to statistics, for we never know how many mistakes statistics may cover. But in the presence of such figures as the above, even if we should have to admit a large portion of mistakes of diagnosis and incomplete recoveries, we should still be warranted in concluding that medical means, and even expectancy, are not absolutely valueless, that the bistoury is not always the *ultima ratio*, and that henceforth we may at least try provisionally, in many cases, a less heroic mode of treatment.

This leads us back to the position before mentioned—that there exist divers forms of appendicitis, and that the first duty of the physician is to make a precise differential diagnosis. Yet if we are to judge from the numerous discussions which have taken place in various medical societies at home and abroad, the surgeons, taking account only of cases where their intervention has been required, do not seem willing to admit the existence of more than one kind, namely, perforative appendicitis with peritonitis or suppuration.

Their reason seems to me to be as just as if, from the good results obtained by pleurotomy in purulent pleurisy, one were to conclude that every case of

pleurisy is necessarily suppurative, and that the only treatment to be thought of in pleural inflammation is the free incision of the thoracic parietes.

27. MEDICAL TREATMENT.

We have said that appendicitis may be divided into medical and surgical. The appendicites properly medical comprehend those forms in which the inflammation is limited to the walls of the appendix, or gains by propagation the peritoneal membrane to a certain extent; *i. e.*, appendicular colic, simple parietal appendicitis, and appendicitis with partial fibrinous peritonitis.

The treatment of these kinds is indisputably medical—calmatives, evacuants, local antiphlogistics; we may add intestinal antiseptics.

The indication in appendicular colic is the same as in hepatic or nephritic colic, *i. e.*, to assuage the pain, which is due to the same cause as in renal or biliary lithiasis—the painful contraction of a musculo-membranous tube due to the presence of a foreign body. The subcutaneous injection of $\frac{1}{6}$ to $\frac{1}{3}$ grain of morphia meets this indication. In allaying the pain, it suppresses or diminishes the muscular spasm and the consequences of the reflex irritation starting in the appendix; and, in suppressing the spasm, it may facilitate the expulsion or return of the stercoral calculus into the cæcum.

The medical attendant will apply at the same

time, over the abdomen of the patient, hot poultices sprinkled with laudanum. If nausea and vomiting exist, effervescent drinks, menthol, little bits of ice, etc., may be prescribed.

The physician is rarely called to witness an acute attack of appendicular colic. When he reaches the patient, either the severity of the attack is over, or there remain only vague abdominal pains with a sensitive *point douloureux* in the right iliac fossa. Here the attention should be concentrated. If the fixed pain is but little marked, if the abdominal walls are relatively supple, the physician will continue the poultices, perhaps order a full bath, and administer an emollient or oleaginous enema. It would be useless to administer at this time a purgative, which might provoke new and unseasonable contractions and give rise to a second acute crisis by forcing back into the appendix the scybalous concretion now perhaps partly or completely disengaged.

If, on the contrary, there exist local signs of a severe appendicular irritation, if the iliac region is very painful and tender, if the muscular tension over this region is very marked, the application *loco dolenti* of a dozen leeches should be prescribed. It is certain that this local blood-letting always brings great relief; it is probable that it causes a *decongestion* or depletion of the walls of the appendix, at this moment turgescient and rigid, as if in erection, as the very early incisions of the American surgeons have often shown.

Profiting by this lull in the pain, the physician may administer a purgative dose of calomel or an ounce of castor oil.

On this question of the employment of purgatives in appendicitis, physicians are divided into two parties; the one favors their systematic administration, the other discards them from fear of favoring perforation. These are extreme positions; there is a proper mean between them.

At the onset it is well to refrain from purgatives, because at this moment the intestine, which is violently excited and under powerful contractions, might force still farther into the appendix the coprolith and effect its permanent lodgment there. At this period the fear of favoring perforation is legitimate, as the intensity of the appendicular inflammation is in the ratio of the degree of constriction exercised by the foreign body on the walls of the diverticulum.

But after the depletion produced by the application of the leeches, the danger is much less, and a purgative may even be given with benefit. Not only does it empty the large intestine, which is always a relief to the patient, but it arouses the normal peristalsis of the muscular coats, which, in being propagated to the walls of the appendix (now become less engorged and less tense), may provoke the expulsion of the coprolith from the canal of the appendix.

We would recommend neither drastics which cause too violent contractions, nor salines which cause a

serous secretion which is abundant and does no good. Castor oil and calomel, producing milder effects, are more suitable. I prefer castor oil, as it more readily carries along the mass of hardened fæcal matters which have accumulated in the colon by the reflex paresis of the muscular coat. My method is to give it in doses of a teaspoonful every half-hour or hour till a full stool is obtained.

The days following, freedom of the bowels is kept up by laxative and antiseptic lavements, *i. e.*, lavements to which boric acid or naphthalin is added. To prevent intestinal fermentation and the formation of gases, it is also well to administer by mouth divers substances which favor intestinal antisepsis, such as salol, naphthol, betol, and benzo-naphthol.

These means ordinarily suffice to stay the progress of a case of parietal appendicitis.

If a new inflammatory invasion takes place, and especially if this be complicated with the signs of a partial fibrinous peritonitis, it will be necessary to renew the application of the leeches and have recourse to frictions with mercurial and belladonna ointment. Opium may be given at the same time in doses of $\frac{1}{6}$ to $\frac{1}{2}$ grain, repeated two, three, and four times a day, to immobilize the intestine and prevent the extension of the serous inflammation. The application of an ice-bag to the abdomen also gives good results.

It is understood that from the very onset of the affection the patient must be kept rigorously in bed

(dorsal decubitus), on a diet of milk or broths, or light gruel, etc.

The sojourn in bed should be continued some time after the cessation of all local pain. As long as you perceive in the right iliac fossa the little elongated tumor formed by the thickened and dilated appendix, the greatest prudence is indispensable, for it is not rare to see a recrudescence of the disease produced on the occasion of a strain, a violent movement of the patient, or too great haste in quitting the bed (the latter especially).

Ought the medical treatment to be employed in the surgical forms of appendicitis? I would reply emphatically: No! on condition that we are certain that it is really a case of perforative appendicitis with peri-appendicular suppuration. No one would think of favoring the resolution of an abscess of the subcutaneous cellular tissue by leeches, poultices, and mercurial inunctions. It would be foolish to attempt it under a pretext that the abscess is intraperitoneal.

But we have seen that it is often very difficult, not to say impossible, during the first few days to decide whether the appendicitis is perforative, and whether suppuration exists. During this first period, as long as perforation is not demonstrated, the physician not only can, but ought to, put in practice the means indicated above. If perforation has not yet taken place, there is nothing to prove that this treatment, suitably applied and in time, may not

bring about the decongestion of the appendicular walls, and in consequence prevent the ulcerative process which ends in rupture into the peritoneum. On the other hand, supposing that perforation has taken place, it is quite possible that this same treatment—leeches, inunctions, opium, and ice—may be capable, not of preventing suppuration, but of limiting the extension of the serous inflammation, and of restricting it to the immediate vicinity of the appendix.

All depends, then, on the moment when the physician is called to see the patient. If at the onset, and at a moment when it is impossible to pronounce with certainty as to perforation, he ought to act as though he thought it a case of simple parietal appendicitis. His conduct will be the same as if the signs of a partial peritonitis manifest themselves, nothing yet warranting the belief that it is a case of perforative appendicitis; experience having shown that this peritonitis may be due to a simple propagation of the parietal inflammation, and it may be purely fibrinoserous, consequently susceptible of resolution and resorption.

Having passed the seventh or eighth day, the mind of the physician should be made up. He should not allow himself to be deceived by the temporary lull that takes place at this moment, so as to believe in the definitive arrest of an attack of simple fibrinous peritonitis when it is only a case of the limitation of a suppurative peritonitis which tends to circumscribe

itself. The medical treatment then becomes useless, save the administration of opium. It is necessary, at all events, to abstain from prescribing any new purgatives, which can but provoke a new extension of the peritoneal inflammation. The time has come to call in the help of the surgeon.

It is understood that these indications have but a relative value. It is as difficult to lay down absolute rules for the treatment as for the diagnosis of appendicitis. The aspect and inspection of the patient often teach more than the most minute descriptions. It is certain that there are cases where, as early as the second or third day, one may resolutely affirm perforation; there are others—more rare, it is true—where even at the end of twelve to fifteen days one would scarcely suspect the true nature of the accidents.

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 with peri-appendicular 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.

THE SURGICAL TREATMENT.

Here the question presents itself which is always the most debated and which is likely to be debated for many years to come: At what moment should recourse be had to the bistoury.

We may range in three categories the views taken on this point.

1. The old view, that of the temporizers who take the extreme position that no operation should be attempted until the abscess is ready to burst before your eyes. It has in its support the cases where recovery has taken place after a spontaneous opening and the evacuation of pus, whether outside the abdomen or into the intestine or vagina. But it leaves the patient exposed to all the risks of deep abscesses, to purulent or putrid infection, to general peritonitis by rupture of the abscess into the peritoneal cavity, to purulent infiltration of the subperitoneal tissue and of the muscles, to the propagation of the inflammation to the diaphragm and pleura, to thrombosis of the iliac veins or of branches of the vena portæ, with pulmonary or hepatic embolisms, etc.

2. The extreme view of certain surgeons, who advocate precocious and instant laparotomy as soon as the diagnosis of appendicitis is made. These men support their position by the following arguments: "We never know that an appendicitis will not be perforative; it is better, then, to remove the appendix before perforation has taken place than to run the risks of general or partial peritonitis. Numerous cases have a fatal termination in the first 24 to 48 hours. Observations are not lacking where an operation too tardily performed has failed to prevent a fatal issue which might have been avoided by an

earlier operation. Lastly, an operation, however early performed, is without gravity, and the utility of such operations is being every day proved.”

Do these arguments justify systematic surgical interference in the first 24 to 48 hours? The first argument need not long detain us. We can never, it is true, know that an appendicitis will *not* be perforative, but we are equally in the dark as to whether it *will* be. And, moreover, if we take all the forms of appendicitis as they come, without making any distinction, we know with certainty that in 90 per cent. the disease gets well without the aid of the surgeon, which shows that, as far as the life of the patient is concerned, the immediate prognosis is not so very grave, and that one may safely wait.

Certainly, if one could affirm, from the symptoms presented by the patient, that a case of appendicitis would be perforating in from 24 to 48 hours, there would be no warrant for hesitation, and it would be the physician's duty to advise laparotomy immediately, before any sign of peritonitis had manifested itself. But, as before said, a positive diagnosis of this kind is seldom or never possible.

Here is an instance of early operation—the earliest that I have any knowledge of, for it was performed just 24 hours after the first symptoms appeared. The case is published by Dr. Dalton, of St. Louis. The patient, a vigorous man, aged 33 years, in the hospital on account of sore eyes, was taken suddenly sick,

Dec. 25th, with a violent pain in the abdomen, referred to the umbilicus. Dr. Dalton saw him three hours afterwards, and diagnosed appendicitis. The next day, just 24 hours after the onset of the attack, he operated. The temperature was then 38.8° C., the pulse 116, respiration 32, the pain intense and almost continuous. A semilunar incision three inches long was made over the region of the appendix. The appendix was found running parallel to the cæcum, and adherent to it by a very short mesentery. It was of a dark blue color, almost black, and largely distended—of the size of the little finger. There was not the slightest trace of inflammation between the appendix and the neighboring parts. The appendix was ligated and cut off close to its cæcal origin. On examination it was found not to be perforated at any point; its canal was blocked by a very hard fæcal concretion floating in a purulent liquid. Recovery was rapid.

Would perforation have taken place here if laparotomy had not been performed? From the appearance of the appendix this would seem probable, but only probable; for we do not know that in the simple forms which get well by medical treatment the congestion of the walls of the appendix is not just as intense. But at all events, if we compare the symptoms complained of by the patient with those of simple parietal appendicitis, we find no peculiarity to warrant the belief that perforation was more to be

feared than in simple appendicitis. Certainly a fever heat of 38.8° C., a pulse of 120, and an intense and continuous pain in the iliac fossa, are observed at the onset in the most benign forms of appendicitis.

We have, then, we repeat, no means of foreseeing the perforation of the appendix—a prevision which alone would justify an operation in the first twenty-four to forty-eight hours. The position of the partisans of this extreme view would, then, necessitate the opening of the abdomen for every attack of intestinal colic attended with intense pain localized in the right iliac fossa—a rule sufficiently absurd in itself, and which medical men will be very slow to adopt in their practice.

The second argument is that a certain number of subjects succumb as early as the second day of the disease. This number is not as large as one might suppose, for out of 176 fatal cases Fitz could find but eight in which death took place during the first forty-eight hours. It would seem, moreover, very probable that these cases belonged to the acute form with general peritonitis—a form which is almost certainly fatal and where surgical intervention from the very first would not save the patient. These rapidly progressive cases, being exceptional, ought not to be the basis of a general rule of treatment; in an immense majority of cases the progress of appendicitis is much slower.

As for the third argument, that an operation per-

formed too late is a calamity to the patient and an opprobrium to the surgeon: that is very true, but it does not justify too early an operation. All we can say is, better that it should be early than late.

There remain to be considered, the little gravity of the operation, and the good results obtained from early laparotomy. Out of 24 cases thus treated by McBurney—six on the second day, fourteen the third day, two the fourth day, two at the end of a week—there were 23 recoveries and but one death. I would not think of contesting either the progress of aseptic surgery or the facility and safety with which to-day surgeons open the abdomen. But the fact that an operation is not necessarily serious, does not justify it if it is not necessary; and we should like well to know in how many of McBurney's 24 cases the operation was indispensable to save the life of the patient.

3. We have now to consider an intermediate position, that of those who believe in an early operation but only when the urgency and gravity of the symptoms furnish indications which the reason and judgment of the physician cannot well misinterpret. No precise time can be fixed for such "early" operation; the limits vary from the third to the fifteenth day. To discuss whether, as a general rule, it is better to operate before the fifth day, which certain American surgeons insist upon, or after the fifth day, as Treves urges, seems to us unprofitable. We say once more, everything depends on the case and on the form of

appendicitis. The truth is that the distinction which we have established between the highly acute forms with general peritonitis, and the acute forms with circumscribed peritonitis, should be kept in mind as a guide in deciding whether and when it is best to operate.

In the hyper-acute forms there is no middle course; either you must operate immediately or leave your patient to die. A diffuse peritonitis caused by intestinal perforation never gets well; to wait is to let your patient become exhausted by the violence of the inflammatory shock, or infected by the putrid products formed in the peritoneum. Besides, it is this hyper-acute form which kills rapidly—the second, third or fourth day. It is necessary, then, to make haste, if you wish the operation (which is the patient's only chance of life) to succeed. The chances for life offered by laparotomy are not very great; it is probable that they are *nil* after the fifth day. Yet there is certainly some chance if the operation is done in time, if the collapse is not too great nor septicæmia too far advanced. The premature interference of American surgeons has at least established this fact. You cannot, then, operate too soon when the symptoms leave no doubt as to the existence of a peritonitis general from the start.

In the frankly acute forms with partial peritonitis, with or without tendency to progressive extension, the urgency is not so great. In fact, in the great

majority of cases which have been published, the operation was not performed till in the course of the second week. Hence, the rule given by American surgeons, that one ought to operate as early as the third day, if at this moment the patient does not experience a marked amelioration under the influence of abstinence, rest, opium, purgatives, and topical applications, seems to us inadmissible in such cases. We prefer for the acute circumscribed forms Treves' rule: *Not to operate before the fifth day.* But with this reservation understood, it remains to determine what is the most opportune moment to operate.

Now, in our judgment, it is extremely difficult to decide on the fifth day whether or not the partial peritonitis is suppurative, or whether it is due to a perforation of the appendix or to a propagation of a parietal inflammation. To lay down a rule that the operation should be performed on the fifth or even the sixth day, is in reality to act as the American surgeons advise and to perform the operation in all cases that present violent or serious symptoms. It is, in fact, risking a laparotomy for a simple partial peritonitis, which might have got well without an abdominal incision.

One might, without doubt, run this risk of an operation in itself needless (though in reality of little gravity) if in cases where the peritonitis is suppurative a delay of several days exposed the patient to mortal dangers. But do these dangers exist on the

eighth or ninth days more than on the fifth or sixth? We do not hesitate to reply in the negative, the moment that the peritonitis tends to become circumscribed.

We may even add that in such cases it is even an advantage not to act too precipitately. Beside the fact that this relative temporizing enables us to determine with more certainty the diagnosis of suppuration, it favors the limitation of the focus of suppuration, its more complete separation from the peritoneal cavity, and the formation of firmer adhesions to the abdominal wall. Now, the published observations show that the longer the operation is put off the more easily it is performed; in fact, the surgeon has simply a deep abscess to open. You have only to run over the series of facts reported by Roux, of Lausanne, to see that out of 23 cases operated on from the seventh to the fifteenth day there were only two deaths—one by embolism, the other by diffuse peritonitis; while out of twelve cases in which the operation was performed from the second to the sixth day, there were three deaths. In two of these twelve cases (which recovered) the signs of general peritonitis manifested themselves early and made the necessity of an immediate operation sufficiently apparent.

We are, then, inclined to believe that in the acute frank forms with partial peritonitis the most opportune moment for the operation, unless special and

urgent indications should present themselves, is after the first week—from the eighth to the twelfth day, during that period of temporary lull, scarcely marked by any fever heat, which follows the first febrile phase of the malady, and which precedes the fever of purulent resorption. To operate earlier is to run the risk of performing a needless operation, as the peritonitis may be simply fibrinous; or even to run the risk of infecting and inflaming the totality of the peritoneum, the protective limiting adhesions not being sufficiently formed or sufficiently resisting. To wait till a later period is (without possible benefit) to leave the patient to become exhausted and to be exposed to the chances of one of those unforeseen complications which supervene abruptly to aggravate an affection hitherto benign, or indefinitely to prolong its duration.

While this is the general rule as to surgical intervention, it may well be that the progress of the suppurative peritonitis is so rapid that on the fourth or fifth day there is no longer any doubt as to the presence of a purulent collection well limited; in this event one cannot do better than to operate at once and no later than the fifth day, as Treves advises. For a greater reason, if the general symptoms are very threatening, indicating an extreme depression or a well marked septicæmia, if the peritoneal inflammation gains rapidly instead of tending to become circumscribed, the operation should not be delayed

another day; it is, of course, needless to say that with such symptoms the best surgical skill cannot offer much hope.

In the case of children, according to Morton, we should operate earlier than in adult patients, because the progress of the appendicitis in infantile life is more rapid, the tendency to invasion of the peritoneum greater, and the termination more frequently fatal. This is true in the sense that in the infant, as we have said, it is the perforating hyper-acute form, with general peritonitis at the onset, which is most often observed. But it must not be forgotten that we also see in the infant very acute forms which limit themselves to an attack of simple partial peritonitis, and which get well rapidly by purely medical treatment. If, then, the diagnosis of general peritonitis by perforation is not doubtful, resort should be instantly had to laparotomy; but if it is a case of partial peritonitis, the management of the case will be precisely as though the patient were an adult, and the physician will not operate unless he is convinced of the presence of pus.

In the hyper-acute forms, the physician should regulate his line of conduct according to the old axiom: "*Ubi pus, ibi evacua.*" One hardly ever runs the risk of operating too early, as the diagnosis is always tardy. And it is important here to operate the more promptly from the fact that pus tends silently to infiltrate distant parts and to produce in

the muscles and neighboring tissues disorders often irreparable.

To sum up: *Theoretically*, surgical interference is indicated as soon as the diagnosis of perforative appendicitis is made. *Practically*, this interference should be immediate in the forms attended with peritonitis which becomes general from the onset; it is the only chance which remains for the patient's life. It ought, in our judgment, to be put off till the eighth or twelfth day in the forms with partial peritonitis, as the diagnosis of suppuration cannot be made certain during the first week, and the chances of recovery seem to us the greater the more thoroughly the purulent collection is encysted.

In the other forms of appendicitis, parietal or complicated with peritonitis by propagation, 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.

29. THE OPERATION.

The best method of laparotomy, as all authorities admit, is by the *lateral incision in the iliac fossa*. Some make it along the right semi-lunar line; others obliquely, parallel with Poupart's ligament.

According to Treves, the semi-lunar incision is bad, because it does not permit direct evacuation of

the pus. It is better to make an oblique incision, directed from above downward and inward, external to the deep epigastric artery, terminating a little above and outside of the middle of Poupart's ligament, following the general direction of the incision made for the ligation of the iliac vessels.

The oblique incision is also the one adopted by Roux of Lausanne. He makes it parallel to Poupart's ligament, one-half inside and the other half outside the antero-superior spine of the ilium, from which it is separated by $1\frac{1}{2}$ to 2 centimeters. It is necessary to avoid as much as possible the epigastric artery, which should be left at the internal part of the lower extremity of the incision. Grave secondary hæmorrhages have been seen in consequence of wounds of this artery (Morton).

This oblique incision allows the surgeon to reach the purulent collection by pressing inward the intestinal coils agglutinated in the iliac fossa. In order to operate with certainty, the incision should be sufficiently long—3 to 4 inches, say the American surgeons; 15 to 18 centimeters, says Roux of Lausanne. It is better not to have the incision too long, for that would favor ventral hernia later on.

The surgeon incises layer after layer down to the *transversalis fascia*. Having reached this point, he incises the peritoneum only in the upper and outer portion of the wound, where he is certain of finding the cæcum. "We then," says Roux, "engage the

index finger between the intestine, which we press inwardly, and the external abdominal wall; then we continue the exploration and the separation to the back part of the abdomen, when the pus does not well out at the first touch of the knife and there are indications that the seat of the abscess is in the retro-cæcal space. If we find nothing, we complete little by little the section of the peritoneum, and continue to explore the iliac fossa, being careful how we separate the adhesions, and searching for the point of insertion of the appendix, that our labor may not be in vain. If the appendix is difficult to find, it is because it is embedded in a mass of adhesions, whence pus is easily made to flow into the wound.”¹

These explorations must be made with the greatest care. One must not forget that the adhesions are recent and consequently very fragile; that in exploring with the finger at haphazard and without precaution one might easily break such as are important, and cause irruption of pus into the large peritoneal cavity. At the same time, an attentive examination of the walls of the abscess, and the tracing out and bringing into light of any and all diverticula and prolongations which the pus sac may present, are indispensable. The pus cavity is often multilocular, with well formed dissepiments, and there is danger of overlooking one or more of these pockets and

¹ Roux, *Revue Méd. de la Suisse Romande*, April and May, 1890.

leaving them intact after evacuation of the principal "*foyer*;" and this would render the operation of no effect.

Besides, the surgeon will search for foreign bodies, scybala, etc., which may be found in the abscess cavity. And lastly, he will endeavor to form an estimate of the condition of the appendix.

Here an important question comes up: Should the appendix be resected and removed?

In certain cases the question is easily answered; the appendix is already gangrenous and detached from the cæcum; it floats in the midst of purulent debris, and escapes with the first flow of pus, or may be easily removed with forceps.

In other cases the appendix, though perforated and partly gangrenous, is still attached to the cæcum, but is easily reached by the hand, and is found agglutinated to the walls of the abscess or to an intestinal coil. The thing to do then is to put a tight catgut ligature above the gangrenous parts, at a point where the tissues seem sound, then to cut and remove all the diseased portion. According to Treves, if the gangrene is total, or if the perforation is seated in the vicinity of the point of cæcal attachment, it is better not to attempt to apply a ligature or remove the appendix—the elimination will take place of itself and without danger.

But there are cases where the appendix, deviated or fixed in an abnormal position, or lost in the midst

of plastic peritoneal exudates, cannot be found. Shall we persist in hunting for it, and in detaching it from the adhesions which bind it down? Most authorities counsel letting it alone. "When the appendix," says Treves, "is very adherent, it is better to make no attempt to remove it by dissection, or even to separate it from its adhesions."

Weir thinks also that it is well to excise the appendix when it can be easily reached, but it is not best to lose time in searching for it. It does not seem to do any harm, he says, when it is left, and ordinarily it sloughs away in a few days.

MacBurney is also of opinion that it is best not to waste time in the search for the appendix; but he adds that to leave the appendix behind is not without danger.

Porter takes the same view, and reports a case in which, after an operation for suppurative perityphlitis, the appendix was left behind and gave rise to a series of recurrences which finally necessitated its ablation at the end of a year.¹

Morton insists that the operation cannot be regarded as complete unless the appendix is removed. Fear of opening the peritoneal cavity should never lead one to hesitate to dissect with the finger in order to expose the appendix, and then to resect it. The only contrary indication is when the appendix is

¹ Boston Medical and Surgical Journal, Dec. 25, 1890.

lost in the midst of a thickened and resistant mass of plastic adhesions, which would render the isolation and ablation of the organ so difficult or so prolonged as to jeopardize the patient's chances.

As will be seen, every case must be decided on its own merits and according to the degree of vital resistance of the patient and the time required for the operation. In fact, the fear of breaking up useful adhesions and causing perforation into a healthy peritoneal cavity will always hold a prudent surgeon in check, and prevent too prolonged a search for the appendix and too prolonged a dissection. While, then, regretting that he is not able to finish the operation and relieve the patient of a useless and dangerous organ, the operator will do well to hold to the rule laid down by Treves and Weir.

After having attentively explored the walls of the abscess and disposed of the appendix (whether resected or left), the abscess cavity is carefully and gently washed out by means of a gentle stream, from a fountain syringe, of a warm antiseptic solution. When it is necessary to wash out the peritoneal cavity, as in the case of general peritonitis, only boiled water should be used.

The surgeon then introduces deep down into the wound, to the bottom of the pus cavity, a large drainage tube or a tent of iodoform gauze. Some surgeons, while leaving a drainage tube or wick of gauze, advise to sew up the greater part of the open-

ing in order to oppose the tendency to hernia. The surgeon will, moreover, always be ready to remove the sutures if he should observe the supervention of swelling or of infiltration of the walls, or if drainage does not seem to go on in a satisfactory manner.

If the total gangrene of the appendix or rupture of the abscess into the intestine has produced an opening into the cæcum, must the surgeon attempt, before completing the operation, to close up the opening by sutures? No; sutures at this time would probably be useless and would not hold, although reunion has been once or twice attempted with success by means of Lembert's sutures. Moreover, the facts prove that cæcal fistulas tend of themselves to cicatrization in a few weeks' time. If, however, the fistula does not close of itself, it may be necessary after a few months to make a new incision and freshen up the edges of the opening into the cæcum, then to close the opening with Lembert's sutures.

30. TREATMENT OF RELAPSING APPENDICITIS.

The following course of conduct will probably meet with favor among surgeons: If, after a series of repeated attacks, which are near together, the diagnosis of relapsing appendicitis is regarded as beyond question, and there are, after careful exploration, good reasons to believe that the appendix is only thickened and dilated, one may, as Treves advises, properly await the interval between two

attacks to make the resection, which in such a case is ordinarily very easy. Secondly, if the relapses are due to the existence of a purulent collection in the neighborhood of the appendix, provoked probably by a foreign body, and especially if each return is accompanied by the formation of an external abscess, the surgeon will make a free incision during an attack and evacuate the pus and irritant body, and will excise the appendix if it can be easily found. Finally, if the relapses are very numerous and, according to the clinical characters which they present, seem to be due to repeated attacks of plastic peritonitis, and if in consequence there is reason to suspect old and thick adhesions, it might be well to follow the advice of Dennis and Morton and wait till another and severer attack shall overcome any hesitation on the part of the patient. The presence of numerous strong adhesions limits the area of inflammation, and renders little probable any further extension to the peritoneum and the dangerous consequences which Treves thinks are likely to follow an operation made during the acute inflammatory stage. Doubtless the task of the operator will not be facilitated by virtue of such acute inflammatory attack.

The following are the rules laid down by Treves for the operation when done in the interval of two relapses: Every symptom of inflammation having ceased, and the position of the appendix being deter-

mined as nearly as possible, the incision will be made obliquely from above downward and inward, over the cæcal region, its inferior extremity terminating just outside the epigastric artery. The incision should not be made directly over the appendix or over the dull region; for by making the incision there you would probably encounter adhesions, and it would be difficult to know whether you were or were not inside the cavity of the peritoneum. The cæcum or the appendix may be found adherent to the anterior wall. The peritoneal incision will then be made with the greatest care. It is better that the parietal section shall open the abdomen exactly opposite the diseased region, where there exist no adhesions. When the appendix and the cæcum are uncovered, the field of operation will be separated by sponges from the great abdominal cavity; if this be well done, not a drop of blood will enter the peritoneal cavity. All the adhesions will be divided on the bistoury; they must not be torn; by tearing them the surgeon would run the risk of lacerating the intestine or peritoneum. The appendix will be divided half an inch from the cæcum; the surgeon will not be content with tying it with a simple ligature. The mucosa will be brought together by several fine sutures or by a continuous suture; then the external coats will be approximated by a new line of sutures. When the walls are very thick, it is impossible to suture the serous coats together. To

render certain the obliteration of the orifice, the surgeon will fix the stump of the appendix to some neighboring portion of the peritoneum. The abdominal incision will then be closed; no drainage tube is to be inserted. During the operation every adhesion liable to become the cause of after-troubles should be destroyed; this applies more particularly to omental adhesions or to those which may exist between the intestinal coils.

Such are the rules laid down by Treves and followed by most surgeons, English and American, in the treatment of relapsing appendicitis.

I will in closing call attention to a last point, *i. e.*, the possibility of a ventral hernia as a consequence of the operation. This kind of hernia does not seem to be rare in America; Bull says he has seen a dozen cases of it in the space of a few months in New York. Hence the American surgeons insist on the necessity of carefully making the suture of the walls layer by layer; it is the best means of insuring a solid union by first intention and avoiding this disastrous consequence. It is, moreover, a good plan to have the patient wear for some time a Glénard's abdominal belt, as Roux of Lausanne advises.

In fine, whether the case is of acute or chronic form, the treatment of appendicitis cannot belong exclusively to either the physician or the surgeon. The first has too great a tendency to temporize, which is often fatal to the patient; the second is too

prone to have immediate recourse to the knife, which is often unnecessary. Only the harmonious coöperation of the two can bring about a wise and wholesome appreciation of the responsibilities and duties of the situation.

“The first indication in appendicitis,” says W. W. Keen, “is to call in the surgeon.” This is true with some qualification. The physician should know just when to summon the surgeon, and the surgeon just when to operate and when not to operate.

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