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*To Mr. Christopher Heath M.C.S.
With kind regards from
the Author.*

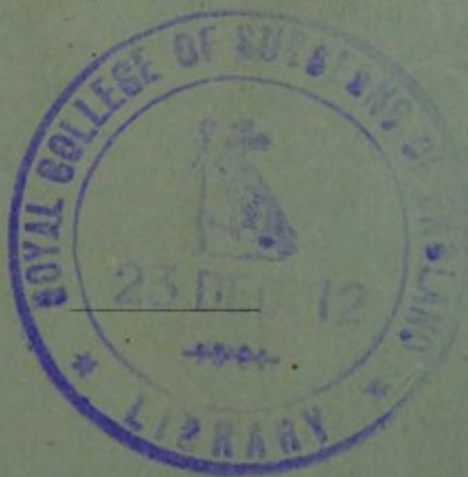
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THE PROPRIETY OF THE REMOVAL OF
THE APPENDIX VERMIFORMIS DURING
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ATTACKS OF APPENDICITIS.

BY

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TO WHOM IT MAY CONCERN

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*THE PROPRIETY OF THE REMOVAL OF THE
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INTERVALS OF RECURRENT ATTACKS
OF APPENDICITIS.¹*

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THE question propounded in the title of this paper is a new one in surgery. Its solution cannot be made at once. The entire subject must first be considered in the light of aseptic surgery, and, having discussed the question from that point of view, the operation must be examined into as to its propriety in certain cases. A definite answer must be postponed until new data and recent clinical experience have afforded us more reliable information from which to judge the expediency of such an important surgical procedure. The propriety of excision of the appendix can be discussed, however, from a theoretical point of view, and reference can also be made to the few reported cases, and from such data some knowledge can be obtained which will at least throw light upon this hitherto unexplored field of operative surgery. The entire subject of iliac inflammations is fraught with

¹ Read before the American Surgical Association, May 14, 1890.

great interest from many points of view. However attractive these inflammations may appear, the discussion in this paper is restricted to one single question in regard to the whole subject, and that is, Is the surgeon justified in excising the appendix after recovery from one or many attacks? The question of removal of the appendix during an interval of quiescence cannot be answered dogmatically. I shall endeavor to demonstrate that the operation as routine treatment in all recurrent cases is unsurgical, and that only in rare cases is it indicated.

With the view to simplifying the subject it seems pertinent to classify these inflammatory attacks; because all inflammations in this region are not identical, either in etiology, in the anatomical part involved, or in the termination.

The opinion has recently been advanced that all of these conditions are dependent upon a primary pathological change in the appendix, and that all the subsequent changes are secondary to an affection of the appendix. For my own part I cannot endorse this view. I have observed many cases that certainly ran a course very similar to typical appendicitis, and yet the cæcum or the pericæcal region were the parts involved, and the appendix was normal. I shall have occasion to refer again to these cases. If the view is accepted that all these changes are secondary to a primary appendicitis, then certainly it must be admitted that this one region forms an exception to the laws governing inflammations in other parts. This belief would imply that there is a part or section of the alimentary canal that enjoys an immunity from primary inflammatory

changes, and that there is a limited area of connective tissue in the right iliac region which is free from initial inflammations, and that there is a restricted zone of peritoneum exempt from a peritonitis except as secondary to an appendicitis. Surely this view is not tenable, and clinical experience clearly points to the conclusion that there is no exception here to the laws governing inflammations in general; but that each part, and every structure, and all varieties of tissue may become the seat of an inflammation independent of an appendicitis. To refer now to a classification of these inflammations. They may, for convenience, be divided into—

1. Typhlitis.
1. Perityphlitis.
3. Appendicitis.
4. Peri-appendicitis.

These different inflammations may merge into one another if no surgical treatment intervenes; but the separate conditions may exist independently, and each may run its course without necessarily involving the other. By a typhlitis is meant an acute or subacute inflammation of one of the several coats of the cæcum. This form may possibly extend to the adjacent tissues. The lesion consists of a catarrhal or ulcerative inflammation, and begins in the mucous membrane. This variety of inflammation is dependent upon fæcal impaction, a septic diarrhoea, a corrosive poison, or an ulcerative process.

There are some surgeons who deny the existence of a localized inflammation of the cæcum. I am confident that I have seen several cases of this kind. The proof of this statement becomes apparent by an

examination of two specimens which I have, showing well-marked ulceration of the mucous membrane of the cæcum, and these changes are entirely independent of any trouble with the appendix. Dr. Janeway informs me that he has recently seen three cases of localized cæcal inflammation. These cases certainly establish the clinical fact which is denied by some surgeons, that a local inflammation in the right-iliac region can exist independent of appendicitis.

The case reported by Mr. Pepper, of London, is another proof of local cæcal inflammation. The vaginal injection of a 1 : 2000 bichloride of mercury solution caused extensive ulceration of the cæcum. The patient died, and the autopsy revealed the fact that the ulceration was limited to the cæcum.

Toxic enteritis may chiefly, if not entirely, involve the cæcum, and after the administration of antimony as well as of arsenic this phenomenon has followed. I have cured a case of extensive ulceration, of eleven years' standing, of the cæcum and ascending colon, by copious injection high into the colon, using as strong a solution of bichloride as the circumstances permitted. After eleven years of septic diarrhœa and hæmorrhage this patient was entirely cured of his cæcal and colon ulceration.

The second variety, viz., perityphlitis, is that form of inflammation which involves the areolar tissue in the vicinity of the cæcum. This leads to suppuration and may exist independent of any change in the appendix. These cases are observed following traumatism, as in sprains of the psoas

muscle, or from some pathological condition in the ilium, sacrum, or vertebræ. I have seen these cases occur after violent athletic exercise; one case occurred after swimming, a second after jumping, and a third after lifting heavy weights. These abscesses go on to free suppuration, are situated in a kind of tissue prone to break down after an injury, are not subject to perforation, but generally point toward the periphery of the body.

The third variety, appendicitis, means an inflammation of the vermiform appendix, and is identical with a typical typhlitis, only that it is more serious in its consequences, owing to the anatomical formation of the part; but the causes which give origin to the change are, in many respects, similar.

The fourth variety, viz., peri-appendicitis, is not so clearly defined as is perityphlitis, because this variety is undoubtedly secondary to an appendicitis. The small amount of areolar tissue about the tip of the appendix is not exposed to the same injuries as the more abundant quantity about the cæcum.

The question of removing the appendix during the quiescent period would therefore involve the last two conditions, viz., an appendicitis or a peri-appendicitis.

It is, then, with an appendicitis or a peri-appendicitis that this question of removal of the organ during an interval of attack concerns us at the present time.

In discussing the operation the first question that naturally arises is, What proportion of cases of appendicitis are recurrent? It is with this percentage of cases that the question of removal of the

appendix arises. There are no definite statistics upon this most important point. Fitz, in his scholarly article, has found in the examination of 257 cases of appendicitis that 28 of the cases were recurrent. This would place the number at about 11 per cent. In other words, 89 per cent. of the cases of appendicitis are solitary and 11 per cent. are multiple. The proportion is about the same in regard to typhlitis and perityphlitis as regards solitary and multiple attacks.

A second question now arises, viz., In the 11 per cent. of cases in which a relapse occurs, what is the termination? If all the 11 per cent. of cases of relapsing appendicitis terminated fatally then the question of excision of the appendix is easy to answer. It is obvious that if all these patients died during one of the recurrent attacks excision of the appendix should be attempted after the first or second attack; because the removal of the appendix would be the only salvation open to these unfortunate individuals. Happily death is not the only termination for this 11 per cent. of cases.

They may terminate in:

1. Resolution.
2. Formation of pus and evacuation of abscess.
3. Perforation and general peritonitis.

It is not known how many of these cases of relapsing appendicitis terminate in resolution. Unfortunately there are no statistics upon this point.

Nearly all of the authorities, however, are in accord with the general statement that a majority of the cases undergo resolution, and that only exceptionally perforation occurs.

The second way in which an appendicitis may terminate is by the formation of pus and the evacuation of the abscess, either spontaneously or by surgical interference. In regard to the chances of recovery offered by an early operation, it has been shown that there are fifty per cent. more recoveries following operations before the eighth day of the disease than after the eighth day, and that the mortality is only eight and one-half per cent. in those cases operated upon before the eighth day. If now the operation of incision is performed during the second or third day of the disease in these relapsing cases, the rate of mortality is lessened to such a degree (as shown by a study of Weir's, Bull's, and McBurney's cases) that the mortality is comparatively insignificant.

If now out of the eleven per cent. of cases of relapsing appendicitis there are deducted first those cases which terminate by resolution, and second, those cases which recover by early incision, it is obvious that only a small part of the eleven per cent. of cases are exposed to the remaining source of danger, viz., perforation and general peritonitis.

The whole question of removal of the appendix, therefore, practically has reference only to those cases in which a general peritonitis, the result of a perforation, is likely to arise. It is under these circumstances that death follows, and the excision of the appendix is the only measure that will remove this cause of almost certain death. The line of argument thus pursued brings us face to face with the clinical fact that removal of the appendix is to be considered only as a means to protect a patient in the future from death by a peritonitis the result

of a perforation. If it can now be shown that in the extreme emergency of a general peritonitis a laparotomy can save a patient, then the removal of the appendix during a quiescent period is deprived in a great measure of the only argument that can be claimed for its performance. Simple reference to the cases of Krönlein, Morton, Weir, Sands, McBurney, and others demonstrates that perforation does not necessarily preclude all possibility of recovery, which is the great argument in defence of removal of the appendix during the period of quiescence. The same line of argument may be carried even further, and it can be shown that perforation may occur and no laparotomy be performed, with still a possible chance for recovery. A proof of this statement may be found by a reference to the following cases.

Dr. Markoe reports the case of a child who had symptoms of general peritonitis upon the second day of an attack. A month later this child died from some other disease and the autopsy showed that perforation of the appendix had occurred, and that adhesions of the intestine had taken place. Dr. Biggs made an autopsy and found the evidences of a previous perforation of the appendix from sloughing. The appendix was found encysted in an old circumscribed peritoneal abscess.

A case is mentioned by Shaw where an abscess was formed in the scrotum from a perforated hernial appendix, and Thurman records a similar case.

Dr. Cabot reports a case where an inch of a previously perforated appendix was found in an abscess

in the groin some eighteen months after an attack of appendicitis.

Ballou and Pooley each report a case where the appendix had sloughed and the patients recovered. Many other cases might be cited to show that even if perforation of the appendix has occurred it is not necessarily a fatal lesion.

Dr. Janeway made an autopsy on a patient who died some time after an attack of appendicitis. The appendix had been the seat of ulceration and perforation; but it had formed adhesions by inflammation to the surrounding tissues and no gas had escaped into the general peritoneal cavity, and as far as the perforation was concerned, the patient lived. It is an illustration of the clinical fact that a circumscribed peritonitis may shut off the appendix from the general peritoneal cavity and that even perforation may occur and not be a fatal lesion.

The best of all proofs that perforation of the appendix may occur and the patient survive such an attack, is found in a case in which an autopsy was made ten years after an attack of appendicitis. It was ascertained that the appendix had been perforated during the attack and that it had been accompanied with abscess and suppuration. Dr. Biggs, who made the autopsy, found that the tip of the appendix had sloughed from its base, to which it was still held by an impervious cord. The entire mass, including the base and apex, with the filiform connection between the two separated parts, was embedded in a mass of inflammatory new-formation tissue, which was adherent to the kidney and to the liver. This patient for ten years had no trouble

with his appendix, and no one ever suspected the nature of his previous attack of illness.

If now I have made the thread of my argument clear, it is obvious that excision of the appendix has to do with only about 11 per cent. of the cases of appendicitis, for 89 per cent. of the cases are not relapsing, and therefore do not belong to the class of cases in which removal is indicated. Of the 11 per cent. a majority recover; because perforation is the exception rather than the rule. Some undergo suppuration and heal. Of the few cases exposed to the danger of perforation and general peritonitis some recover, as is shown by a reference to the cases just mentioned.

It is now pertinent to consider in detail the real arguments against removing the appendix during a quiescent period in the few cases where the attacks have been recurrent. The arguments which I would respectfully submit against this operation of excision during a quiescent period in relapsing cases are as follows:

1. The danger to human life.
2. The difficulties of a positive diagnosis.
3. The development of ventral hernia.
4. The lack of conclusive evidence that excision of the appendix is attended with permanent relief.
5. The result of relapsing attacks may afford an immunity from danger in the future.

1. *The danger to human life* is an argument which confronts the conscientious surgeon. Opening the abdomen for the purpose of finding the appendix vermiformis is certainly attended with risk to life. That risk increases in accordance with the amount

of pathological change that has taken place. I must dissent from the view held by Morton, who speaks of this procedure as a "comparatively trivial operation at a time and under conditions when prompt and permanent relief and recovery can almost invariably be secured." The same opinion is also expressed by Senn, who writes: "Excision of the appendix in cases of simple uncomplicated appendicitis is one of the easiest and safest of all intra-abdominal operations." Such statements are misleading. In May, 1887, I excised the appendix, on account of a stab-wound, with no difficulty as regards finding it; but to remove it and to invert the edges and to introduce sutures and to close hermetically the opening into the cæcum is a delicate operation which requires nicety of *technique*. It is by no means to be considered a trivial procedure, and upon the result of the operative work of the surgeon depends the life of the patient. The giving way of a stitch or the sloughing of a small shred exposes the patient to imminent peril. One bubble of intestinal gas is sufficient to infect the whole peritoneum, and such a catastrophe will in all probability lead to a fatal termination. The possibilities of hæmorrhage, of purulent œdema, of septic peritonitis, of suppression of urine, and of surgical shock must not be overlooked. These are the dangers to which a patient is subjected in the ordinary cases; but when, from recurrent attacks, adhesions have formed, the connective tissue has undergone pathological changes, the cæcum has become dilated, and the anatomical relations are disturbed, excision of the appendix becomes a serious operation. Surgeons have at-

tempted to find an analogy between removal of the appendix and of the ovary. This comparison causes a tendency to attach too little importance to the excision of the appendix. It must be borne in mind that the vermiform is an integral part of the alimentary canal; it often is adherent to the large and important bloodvessels, it may be buried under the cæcum, it may be firmly imbedded in inflammatory exudation, the tearing of which may result in a rent in the intestine or ureter, and the sewing up of which requires time and skill. Not so with the ovary, for here the oozing is easily controlled, and if a pus cavity is found the cavity can be easily washed out and rendered aseptic. For these reasons the excision of the appendix cannot be looked upon in any light other than that of an operation attended with considerable risk to human life.

The operation of removal of the appendix during an interval between the attacks has been attended with a death-rate the precise percentage of which cannot be at present ascertained, because a report of all the cases has not yet appeared in print. It is safe to state, however, that the death-rate is higher than that of early incision on the second or third day of an attack. This one argument alone deprives the operation of its greatest advantage. Thus far, in dealing with this subject the ability to find and to remove the appendix has been assumed; but a most serious aspect of this question is the failure to find the appendix after the abdomen has been opened, or, owing to extensive adhesions, an inability to remove the organ. Recently

I was present at an operation for the purpose of excision of the appendix. The laparotomy was performed upon the patient during the quiescent stage, and although the surgeon was one of the most skilful operators and one of the best anatomists, he was unable to find the appendix after a long and tedious search. The abandonment of this operation was wise and prudent, and I mention this clinical fact to impress the point that the operation is, of necessity, attended with great danger where a prolonged search must be made with the peritoneal cavity opened and the intestine exposed. When an operation becomes necessary it should be performed early during an attack, and at the same time removing, if necessary, the appendix. It is the proper line of treatment. It is quite another thing after an attack has passed and in the quiescent stage to attempt an excision. In the former case it is indicated to save life, in the latter case it is fraught with great danger to avoid a possible future attack, from which the patient may even easily recover.

2. *The difficulties of a positive diagnosis.*—No surgeon who has seen many cases of abdominal surgery can overlook the fact that the diagnosis is often fraught with the greatest difficulties and with much uncertainty. The more cases examined the more real becomes this fact. It is often impossible to arrive at a positive and clear diagnosis as to the real condition that has given rise to the attacks. The most skilled diagnosticians and the most experienced surgeons have made errors in diagnosis as regards lesions in this region. It is only necessary to review the list of diseases that already have

been mistaken for appendicitis in order to estimate the weight of this argument against excision of the appendix during a quiescent period.

Among the conditions that have been mistaken for appendicitis may be mentioned the following: General or circumscribed peritonitis, pelvic peritonitis, renal, biliary, and intestinal colic, ovarian and lumbo-abdominal neuralgia, intestinal obstruction, floating kidney, pyelitis, cæcitis, internal strangulation, psoas abscess, pelvic cellulitis, rupture of the serratus magnus muscle, suppurative adenitis, typhoid, tubercular and stercoral ulcers, caries of ilium and of vertebræ, morbus coxarius, suppuration in the retro-peritoneal and mesenteric glands, traumatic rupture of intestine and right ureter, rupture of the bladder and of the gall-bladder, rupture of an aneurism in the broad ligament, sprain of the iliacus and psoas muscles, salpingitis of the right tube, abscess of liver, tubal pregnancy, typhlitis and perityphlitis.

This list does not embrace nearly all the conditions which eminent men in the profession have frankly acknowledged to have mistaken for appendicitis, or *vice versa*. The list, however, is of sufficient size to impress the important point that errors in diagnosis may occur, and that a laparotomy for excision of the appendix may be performed and the real pathological condition which the operation is intended to relieve be other than a diseased appendix. Finally, it is significant that in some of the cases in which the appendix has been removed during the quiescent period no change sufficient to cause trouble could be found in the appendix.

Within a month I have examined a specimen showing a perforation of the cæcum where appendicitis was diagnosed. If this patient had survived the attack and the appendix had been removed the operation would have been of no avail, for the lesion was situated in the cæcum.

3. *The development of ventral hernia.*—This interesting observation has been made by Dr. Bull, whose brilliant work in abdominal surgery is of world-wide reputation and entitles his opinion to the highest respect.

This condition is not likely to follow the early incision which is made during an attack to allow pus to escape, because the incision under these circumstances is very small, whereas, in a laparotomy for excision of the appendix during the interval of attacks, the length of the incision is from four to five inches. Several cases of ventral hernia following operations for removal of the appendix have been reported. The special situation of this incision and the peculiar character of the parts divided, and the tendency of the wound to gape, render the development of hernia a most serious complication. There is no doubt that this condition can give rise to strangulation, and even if strangulation does not follow, the presence of the ventral hernia is a source of great discomfort and annoyance to a patient.

4. *The lack of conclusive evidence that the excision of the appendix is attended with permanent relief.*—Time is the crucial test to settle this important point. The cases that have been published bear witness to the fact that the operation has been performed, but the period of time is too short to base

any conclusions as to the ultimate result. If the excision has been performed in a case where the appendix alone was involved, the result may be satisfactory as regards the appendix; the pathological process, however, which established the lesion in the appendix may subsequently develop in the cæcum and changes similar to the original attack may then ensue. If the appendix has been removed when the lesion is in the cæcum the relief does not follow.

To what extent the operation will afford immunity in the future is still a question *sub judice*. There is positive evidence that recurrent attacks may terminate in a final one with recovery, and the patient enjoy years of immunity. He may never have any return of the trouble. I know of one patient residing in a southern State who has had fourteen consecutive attacks of appendicitis; but during the past five years has never had the slightest indication of any disturbance. These fourteen attacks occurred during a period of a few years, and the patient was able to trace the cause of the attacks to the use of cathartics and to a peculiar diet. Since he has abandoned cathartics and has lived upon a meat and gluten diet he has never had the slightest indication of trouble. His appendix may be so situated as to never develop another attack. An attempt to excise his appendix might be attended with a fatal issue.

5. *A condition following relapsing attacks may afford immunity from danger in the future.*—I feel certain that some surgeons will dissent from this view; but I shall endeavor to prove the correctness

of the statement from pathological material and from clinical data. One great mistake that surgeons commit in discussing this subject is to consider all cases of appendicitis doomed to immediate death. Investigation and observations are made at the time of a contemplated incision to avert perforation, consequently the subject is viewed from very narrow limits. I believe that often a single attack from which recovery follows places the appendix in such a position that no further harm can result to the patient. For example, I have four microscopical specimens showing that the appendix in a cross-section has become completely obliterated as a result of appendicitis, and that instead of the normal duct with its narrow lumen filled with glairy mucus an impervious cord exists. This change is the result of a previous inflammatory process, as is seen by an examination of the tissue. I know of other cases where the same condition is present. If this is true in regard to a single attack, why may not the last of recurrent attacks place the appendix in this same condition? An appendix, then, that is an impervious cord becomes so by inflammatory processes, and I fail to find a report of an autopsy where the patient died from an attack of appendicitis and in which the appendix was an impervious cord.

These cases of obliterated appendices are found incidentally, and upon microscopical examination the fact is revealed that the cords are the result of a previous attack of appendicitis. But the impervious cord is not the only condition that may afford immunity to a patient. For example, I have speci-

mens showing some interesting conditions resulting from appendicitis. One specimen shows that the duct was embedded in a dense stratum of inflammatory new-formation behind and to the outside of the cæcum, and entirely shut off from the general peritoneal cavity. A perforation had previously taken place. A small foreign body was lodged in a circumscribed cyst cavity. In another case an autopsy was made upon a patient who had died suddenly from heart disease, and the appendix was found buried in a mass of areolar tissue continuous with a dense band of tissue adherent to a cicatrix upon the skin. This mass of tissue in which was embedded the appendix with a cicatrix denoting a slough was behind the cæcum and the peritoneum. Several years previous this patient had suffered from an attack of appendicitis; perforation had followed and the appendix was placed in a position never again to give rise to any trouble. The condition of perforation was not diagnosed at the time of the attack and the patient never suffered ill consequences from the new position of the appendix. I have also another specimen of an appendix which was situated behind the cæcum and adherent to it. A perforation of it would have been extra-peritoneal, and in that case the danger of a purulent peritonitis would have been avoided. I believe that exceptionally a few of these cases of abscess connected with the appendix are outside of the general peritoneal cavity; but, of course, the large majority of them are intra-peritoneal. Any attempt to excise an appendix during the quiescent period under the circumstances just mentioned

would be attended with very great danger, whereas no trouble would ever arise from the condition of the parts.

I know of three cases where the appendix had become adherent to the wall of the cæcum and perforation had occurred through the adherent surfaces directly into the lumen of the cæcum. The escape of pus *per rectum* is the proof offered in these cases of typical appendicitis. The patients recovered and the appendices in their present condition of adhesion with the cæci will probably never give rise to mischief.

To recapitulate, it seems from an examination of the clinical facts and of the pathological material, and from a careful study of the reported cases of appendicitis that excision of the appendix pertains to only eleven per cent. of all the cases of appendicitis. Of these cases represented by eleven per cent. many undergo resolution, some terminate by abscess opening spontaneously or by early incision, while a few are exposed to the dangers of perforation and general peritonitis. Excision of the appendix is suggested as a preventive measure in the small percentage of cases of relapsing appendicitis in which perforation is feared. It has, however, been clearly proved by my specimens that even perforation and general peritonitis are not in all cases fatal complications.

So, then, if those cases of perforation in which recovery follows—and they are more frequent than has been supposed—are deducted from all the cases of perforation, there are left but a few concerning which the question of the propriety of excision of

the appendix would arise. If, now, it is remembered that an incision on the second or third day during the attack in relapsing cases, is attended with most brilliant results, showing a mortality of only a small percentage, is it not wise to observe conservatism and decline to excise the appendix during a quiescent period, when its death-rate is higher than the death-rate of early incision upon the second day? The results which Dr. Willard Parker obtained by operating during the second week after adhesions had formed were brilliant, considering the high death-rate previous to his suggestion. The improvement upon Dr. Parker's operation by early incision upon the second or third day has left but little to be desired in the management of these cases during an attack. Are not, then, a patient's chances for life better after an incision upon the second or third day during an attack than they are after a laparotomy performed during the quiescent period, with the view of removing an appendix which may not be found, and if found cannot be safely removed. Does not such an operation expose the patient to a greater peril than the management of a future attack by early incision?

In conclusion the clinical fact must not be lost sight of that the last attack from which the patient suffered, may have placed his appendix in a position that precludes the possibility of a future attack. From a consideration of these facts it seems wise to condemn the operation of excision of the appendix during the quiescent period as routine practice. Some special reasons should exist to jus-

tify the operation—reasons that do *not* exist in the majority of cases of relapsing appendicitis. That occasionally a case may be presented in which excision of the appendix is indicated, I do not deny, but as routine practice in all cases of relapsing appendicitis it is a measure fraught with greater danger than incision and removal upon the second or even the first day of a recurring attack. If this very early incision, as suggested by Sands and practised in several cases by McBurney and others, is resorted to in these relapsing cases, the question of excision of the appendix will arise only in connection with an early attack. If relapsing cases are operated upon at the onset of the trouble the prognosis is better than in those in which later incision is employed. It is one of those operations of expediency which should never be performed, even in a case preëminently suitable, without a thorough examination of the heart, lungs, and kidneys, for under no circumstances, with organic disease, should so bold an operation be resorted to unless the patient is confronted during an attack by death itself. To excise during an interval between recurring attacks in a patient suffering from any organic disease is exposing that patient to a certainty of death, while conservatism might result in a prolongation of human life, during which time no other attack may arise. If an attack should develop, the early operation upon the first or second day in a relapsing case might offer a prospect of recovery that would be more favorable than was at first supposed. At all events, this line of practice does not expose the pa-

