destroyed. For the last two years the method has been to use much smaller doses spread over a longer time. Needles containing 2 or 3 mg. of radium are put in and left for seven to ten days. This method has given much better results, but it has been found necessary to increase the dose up to 6,000 mg. hours and more, and also to increase the screening. Screens of 0.5 mm. of platinum cause necrosis around the needles and very dense fibrosis of the neighbouring tissues. We are now increasing the screening to 1 mm. of platinum, with beneficial results. I have tried, in addition, placing the needles in rubber catheters to increase the distance between the radium and the tissues, and I think this tends to reduce local necrosis, but the insertion of the catheters is troublesome.

The method of dealing with growths that I have chiefly used has been to expose the rectum from behind after removing the coccyx, or such part of the sacrum as is necessary, and to insert 3 mg. needles into and around the growth about 1 cm. apart, the object being to expose all parts of the growth to a lethal dose of radium as uniformly as possible. The needles are placed roughly parallel to the bowel lumen. If inserted at right angles to the lumen it is almost impossible to avoid some of the needles perforating the lumen, with consequent serious infection. The number of needles inserted depends upon the size of the growth and the amount of lymphatic spread into other parts. After the needles have all been placed in position the silks to which the needles are attached are tied together and pushed into the wound, which is closed with a small drain. At the end of a week or ten days the wound is reopened and the needles removed. After this the wound is not reclosed, but is left open and freely drained with tubes.

This method has to be modified when the growth is on the anterior wall of the rectum. I have in such cases exposed the rectum by an incision in front across the perineum and barraged the growth in a similar manner, care being taken in a male subject not to place any needles quite close to the urethra and not to get needles in front of the vesiculae seminales. In this way I have so far avoided causing damage to the urethra or bladder.

The greatest difficulty is in dealing with the area of lymphatic spread on the pelvic and abdominal aspect. For this purpose the abdomen has to be opened and the needles inserted into the upper part of the mesorectum and the areas on each side of it. All the early cases developed a plastic peritonitis which had to be drained and was clearly due to the action of the radium on the peritoneum. To get over this, packing had to be inserted over the needles and free drainage provided. This difficulty I am trying now to get over to a large extent by using radon seeds for the abdominal barrage in place of needles. This at any rate saves having to reopen the abdomen at the end of a week or ten days.

The results of radium treatment are that the growth in the course of a few weeks begins to get markedly smaller and the ulcerated area heals. In a successful case the growth entirely disappears, leaving normal tissue in its place. Very often there is a considerable amount of scarring and thickened fibrous tissue in the situation of the growth, but this tends gradually to soften in course of time. Unfortunately, what too often happens is that the growth is not entirely destroyed, and the main mass disappears, leaving islands of cancer tissue that have failed to be destroyed. These islands can be attacked again with radium needles or radon seeds, but it is very difficult to be sure that they have been adequately treated, and the dense fibrous tissue resulting from the first treatment makes insertion of the needles at the second operation peculiarly difficult.

The main difficulty of the radium treatment of cancer of the rectum is that of access to the growth. It is not easy to get satisfactory access to the upper part of the growth, which is in many ways the most important. One has to work at a considerable depth and endways to the main mass, also the bowel is thin, and it is very important not to injure the lumen.

Another difficulty is that the wounds are very slow in healing, and considerable sepsis is at present unavoidable.

Sepsis is due partly to the fact that some necrosis in the immediate neighbourhood of the needles seems inevitable, and partly to the fact that the action of the radium is very markedly to lower the natural resistance of the tissues to infection. If proper care is taken to avoid a primary sepsis at the time of the operation the sepsis is only secondary, and therefore not serious, but it is very tiresome and makes convalescence very slow.

The chief indications for improvement in technique in these difficult cases appears to me to lie in the direction of: (1) Increased screening of the radium to cut out the action of unwanted rays. (2) The use of radon seeds to barrage the growth and infected lymphatics from the abdominal aspect in place of needles. (3) More successful aseptic methods in respect of the wounds of access.

It is too soon as yet to give any figures of the results of radium treatment in these cases. Some of the results are good, some very unsatisfactory. My object in writing this paper is to give some of the results of my experiences with the treatment, in the hope that it may encourage other surgeons to do the same. It is at the present time, when the technique of treatment is developing, that an exchange of views and experiences is most likely to be of value.

THE OCHSNER-SHERREN (DELAYED) TREATMENT OF ACUTE APPENDICITIS: INDICATIONS AND TECHNIQUE.*

BY

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I WAS brought up in the belief that as soon as acute appendicitis was diagnosed immediate operation was always indicated unless the patient was obviously getting over the attack. This was my faith until I became surgical registrar to James Sherren at the London Hospital. Association with this eminent surgeon was responsible for altering my views; slowly I began to realize that an appreciable number of deaths and many complications are due to immediate operation in certain phases of the disease.

The "delayed treatment," as McNeill Love has called the postponing of operation in selected cases, was originated by Albert J. Ochsner of Chicago, who published his first communication on the subject as long ago as 1902. James Sherren's treatment differed from Ochsner's on many points, and some of the details of his method have been still further modified by his pupils.

The objective of the Ochsner-Sherren school is to help to reduce the serious total mortality of appendicitis, which, at the present time, in spite of better transport, increased hospital facilities, better technique, and a full post-war complement of a temporarily depleted medical profession, shows no abatement. Not even its few ardent supporters would attempt to deny that the delayed treatment of appendicitis is open to abuse, and if abused would defeat the very object of its inception. Just as we believe that its universal adoption under proper conditions would help to reduce mortality, so we freely admit that its misinterpretation would prove disastrous. Evil lies in the abuse of all good things.

The treatment is not merely a postponement of operation; it is not just the old "interval appendicectomy"; it is unfair and inaccurate to dub the treatment as temporizing; it is not a substitute for operation, but a preparation for it—essentially a surgeon's treatment, to be undertaken only in a surgical hospital, or a correspondingly equipped nursing home, with a nursing staff trained in the method. Above all, in a civilized country, the treatment must always be carried out on the very threshold of the operating theatre. As private houses are not thus equipped, it should be regarded as criminal to attempt the treatment in the patient's home. But one can picture

* An address given to the Leicester Medical Society on November 13th, 1929.

circumstances—for instance, in a small ship at sea—where to attempt the treatment would be less dangerous, by reason of these circumstances, than to attempt operation. At home the duty of the practitioner remains as heretofore to arrange for the admission of the patient to hospital as soon as acute appendicitis is diagnosed—and by his example and teaching to mitigate the ingestion of purgatives in cases of undiagnosed stomach-ache. With the advent of that Elysium when all cases of acute appendicitis are in the hands of the surgeon while the disease is still limited to the appendix the need for the Ochsner-Sherren treatment will pass. In the meantime, the general adoption of its principle would doubtless prevent many deaths among those patients who arrive “too late for the early operation and too early for the late operation”; particularly would it prevent many of those deaths which come under the heading of disappointments, the victims being far from moribund at the time of admission.

Selecting Cases for the “Delayed Treatment.”

The history is taken, and particular note is made of the number of hours since the onset. The history begins “10, 26, 55 hours ago,” not “last Thursday,” or “three days ago.” The physical signs are then recorded in diagrammatic form. The extent of the rigidity is marked by shading; the presence of a lump is drawn as near as possible to scale. The presence or absence of hyperaesthesia is always recorded, and the findings of a rectal examination are not omitted. It is necessary to include these particulars, for it is impossible to proceed without minute attention to detail, for fear of being misunderstood.

If the diagnosis of acute appendicitis is made and the history is of *under forty-eight hours’ duration* immediate operation is nearly always advised. If the diagnosis of acute appendicitis is made and the history is *over fifty hours’ duration* one should ask oneself the question, “Is there any reason why this appendix should be removed at once?” The answer by one trained in the delayed treatment is “It is safer to postpone operation for the time being, unless . . .”

Exceptions to the Rule.

1. Hyperaesthesia is present. Providing that the other signs are consistent this may be taken as good evidence that the appendix is still unperforated.

2. Age under 5 years.

3. The diagnosis cannot be made between acute appendicitis and some other intra-abdominal catastrophe normally requiring immediate operation—particularly perforated diverticulitis and perforated duodenal ulcer.

4. General peritonitis has supervened. Only cases which have obvious general as opposed to pelvic peritonitis are excepted.

5. The recent ingestion of a powerful purgative may be a justifiable indication for performing operation which otherwise would be delayed.

The careful reader will have noticed a disparity of two hours between the forty-eighth and fiftieth. A little latitude is left for the benefit of individual judgement. As a general rule in my practice, unless hyperaesthesia is present, all cases which have passed the forty-eighth hour since onset are placed upon the Ochsner-Sherren treatment in the first instance. If any of the other contraindications enumerated above enter the picture the case is re-examined and reconsidered after a lapse of two hours.

Technique of the Treatment.

The patient is placed in Fowler’s position. There are many ways of interpreting Fowler’s position. When the position is ordered for a case about to undergo the Ochsner-Sherren treatment it is of paramount importance to see that what is known as high Fowler’s position is effectively maintained.

High Fowler’s Position.—The head of the bed is raised eighteen inches on wooden blocks. What is more convenient and quite as efficient as the wooden blocks is a

fitting supplied by Hoskins and Sewell of Birmingham (see figure). This bed-lifter can be readily attached to any bedstead, and it permits of the bed being wheeled about without any alteration of the patient’s position. A useful fitting for maintaining the necessary flexion of the

knees is the Burton donkey, which is cleaner and cooler in hot weather than the customary suspended bolster.

Charts.—As a routine the pulse is recorded every two hours in graphic form on a special chart. In cases where anxiety is felt as to the advisability of continuing the treatment an hourly chart is employed. On several occasions, when the peritonitis has been widespread, I have even had a half-hourly chart prepared through the night. Temperature is relatively unimportant, and it is recorded every four hours. Instructions are given to the nurse to record any vomiting on a separate piece of paper, known as a vomit chart. On this is entered the time at which the vomitus was ejected, together with the quantity and character of the fluid.

Diet.—Water only is given for four days, or occasionally longer. This is very strictly adhered to. The amount of plain cold water the patient may have is unlimited, although he is not encouraged to drink more than is necessary to satisfy his thirst. In order to prevent accidents we have a notice put over the patient’s bed, “Water only; no purgatives.” It is very desirable to explain to patients that they are going to be starved—“in order to prevent the appendix bursting” is what I tell them. On the fifth day, if the pulse and temperature are satisfactory and the patient feels hungry, feeding is commenced. Small feeds of Benger’s food, alternating with a cup of bovril, are given. On the sixth day custard and jelly are allowed. After that the diet is gradually increased. Regarding diet Ochsner himself instructed, “After the patient has been normal for four days give commercial beef-tea in small quantities, later broth, later strained gruels, later strained soups. Do not give milk until at least a week after the patient is apparently well.” I was not aware until recently that Ochsner prohibited milk. We have been giving it in the form of Benger’s food from the fourth day with satisfactory results.

Drugs.—All drugs are forbidden. It should be particularly noted that no morphine or its derivatives are given.

Bowels.—The bowels are left confined if they are not opened naturally. On the fourth or fifth day a small glycerol enema is given. No purgatives of any kind are given until resolution is complete—that is, until the temperature and pulse have been normal for a week and pain and physical signs are absent—then liquid paraffin, 2 drachms thrice daily, is prescribed.

Pain, as opposed to tenderness, is very seldom complained of after the first night of the treatment. A hot bottle may be given to the patient to apply to the abdomen; but it is well to repeat that as long as the inflamed appendix remains *in situ* drugs are forbidden, for they may mask those all-important signs which foretell that the delayed treatment is not likely to succeed.

Instructions are given for the nurse in charge to watch the patient and report immediately (1) a rising pulse rate;

(2) vomiting; (3) pain; and, in the later stages of the treatment, (4) diarrhoea or the passage of mucus in the stools (pelvic abscess).

A rising pulse rate in the early stages is the most reliable single sign that it is dangerous to proceed with the delayed method. If the pulse rate has increased even ten points in the first four hours, operation is often indicated. I do not feel at all alarmed at a moderate rise in temperature. It quite often indicates that the patient is exhibiting a good reaction to the inflammatory process; it does not necessarily mean that a local abscess is developing, though this, of course, may be the case, and will be revealed by the physical examination. A moderate rise of temperature with a pulse rate in the eighties or nineties does not foretell failure of the delayed treatment.

Vomiting after the first few hours should always be regarded seriously, and this by itself may be a sufficient indication to abandon delayed treatment.

A patient undergoing delayed treatment should not complain of pain, as opposed to tenderness, after the first six hours of treatment. If he does there is usually something wrong, and this is a strong indication for operation. In the few cases in which pain has been the determining factor in advising operation a large thick-walled unperforated appendix has been found. The patient was experiencing appendicular colic.

After six and a half years' experience of the Ochsner-Sherren treatment I have nothing but praise for it. Several hundred cases have resolved uneventfully. As in surgical practice one always seems to get ill fortune in batches, it sometimes happens that several cases in a short period of time fail to resolve. If the delayed treatment fails, and the patient has been starved for some days, the urine should be examined for acetone before the anaesthetic. In any case glucose and saline is prescribed. If acetone is present it is often good practice to perform the operation under spinal anaesthesia.

I have tried to emphasize the possible dangers of this treatment in order that there should be no slackness in its application. In order to strengthen the confidence of those who have not had the advantage of a thorough training in the method I can state with assurance:

1. Subphrenic abscess is almost unknown, and I have not had a case which could be attributed to the Ochsner-Sherren treatment.

2. Pylephlebitis does not occur. I have had a number of cases of pylephlebitis, but not once has it developed in a patient undergoing delayed treatment.

3. Intestinal obstruction is very much rarer than after immediate operation.

4. The treatment is not a hardship to the patient.

5. In the long run there is very little wastage of hospital beds. But what is this in the matter of saving a useful life?

One of the most important duties in a case where the delayed treatment has proved successful is to ensure that the patient has his appendix removed in due course. In former days it was the custom to perform appendicectomy before the patient left hospital. This is, without question, a great mistake. Experience shows that in an average case an interval of two months is necessary for the products of inflammation to resolve completely. Appendicectomy soon after clinical resolution is often a very difficult operation, and the patient, by reason of the starvation, is ill prepared to stand it. If an interval of two months elapses between the time he is fit to be discharged and the operation it will be found that everything has settled down, the patient's general condition will have improved, and the operation will be comparatively easy. It is remarkable how few adhesions are found.

Unfortunately, a very real danger creeps in. The patient may fail to reappear for his operation. I found that more than 5 per cent. of those who had successfully undergone the Ochsner-Sherren treatment failed to return. They were written to and a proportion replied, with varying excuses, the principal being that they had not understood. In 1926 I adopted the following plan. As soon as it is evident that resolution of the disease may be confidently expected

the patient is handed two cards to sign. On each is printed the following words:

I realize that I have just been tided over an attack of appendicitis. The surgeon considered that in my case it was safer to defer operation. I fully understand the danger of leaving the appendix, and I agree (1) to come into hospital on _____; (2) to report at the hospital immediately if I have any symptoms before that date.

One card the patient takes away; the other is indexed and serves to remind the staff of the appointment, which, except in special cases, is made for a date two months after leaving. This method has worked admirably, and frees the surgeon of the responsibility of inadvertently omitting to explain adequately the necessity for eventual operation.

Appendix Abscess.

"Where there is pus you must let it out" is an old and wise surgical axiom. Nevertheless, it is well established that the rule may be broken in the case of small and moderate-sized appendix abscesses, for these cases often do exceptionally well under the delayed treatment. The lump, which no doubt is in part made up of inflamed omentum, but in most instances contains at least some pus, with starvation and rest gradually gets smaller and smaller, and finally disappears. When the time comes for the appendix to be removed one often marvels at the freedom from adhesions; perhaps there are a few dried-up pieces of leathery substance stuck upon the appendix or the juxta-appendicular structures, but this is all that remains of what was once an undoubted abscess giving rise to a lump, say, the size of a cricket ball. To those familiar with the delayed treatment such a phenomenon is commonplace. But I find that to most of my assistants (trained in various parts of the country) the resolving of an appendix abscess and the eventual operation and demonstration of the comparatively normal-looking appendix is a surgical astonishment second to none.

We will assume that the patient has been admitted with appendicitis of several days' duration and a lump is present in the right iliac fossa. The Ochsner-Sherren treatment is carried out in exactly the same way as has just been described. The periphery of the lump is outlined on the skin and each day the lump is examined. A rectal examination is performed every third day, or more often if the abscess has invaded the pelvis.

Indications that the Abscess must be Drained.

1. The lump is not getting smaller after the fifth day, or, alternatively, is getting larger before this time.

2. The lump is visible when the abdomen is viewed tangentially.

3. The temperature is swinging above 100° F. on several successive days. A moderate intermittent rise in temperature is not a contraindication to delayed treatment.

4. Childhood. I now treat children above the age of 4 years by the delayed method, but drainage becomes necessary more often than in the case of adults.

5. Fluctuation can be elicited—a rare occurrence which may indicate that the abscess has already been left too long.

6. Pelvic abscess. It is difficult to estimate the size of an abscess which has invaded the pelvis. That a pelvic abscess is developing is always heralded by diarrhoea, and often the passage of mucus in the stools. When pelvic abscess has been diagnosed a rectal examination is performed daily. When the abscess feels quite soft—this often takes five or six days or longer—I drain it into the rectum.

If delayed treatment has been tried, as I feel convinced it should be, the number of appendix abscesses which need drainage will be comparatively small. Those that do not require evacuation of pus will be frank abscesses, and the technique may be reduced to the simplest character, for the question of removing the appendix at the time of the evacuation of the pus never arises. This, no doubt, helps to account for the very small mortality of appendix abscess treated on the above lines. We are spared the possibility

of turning a localized abscess into general peritonitis, a tragedy which I have witnessed under the old regime of immediate operation.

Acute Appendicitis with Grave General Peritonitis.

When the pulse is feeble in the neighbourhood of 140, and the abdomen drum-like, or other combinations of signs make it undeniable that the peritonitis is frankly general, the interests of the patient are best served by adopting a conservative attitude, at any rate for the time being. In addition to the usual delayed regime order:

1. Subcutaneous saline (rectal saline may not be absorbed).
2. Concentrated anti-gas gangrene serum, 10 c.cm. intramuscularly.
3. Camphor in oil, 10m two-hourly; three doses. Repeat if necessary.
4. An hourly pulse reading.
5. Aspirate the stomach contents if vomiting is in evidence.

In all but the moribund some improvement in the general condition takes place, and in a few hours the patient is again examined and the facts of the case reviewed. In deciding the momentous question what to do for the best the following summary may be taken into consideration.

The day is not long past when it was considered that the patient's only chance lay in an operation, and, above all, in free drainage. Close attention to the subject has shown that the problem before us is not nearly so simple as this.

It will be recalled that Ochsner himself first framed his method for cases of spreading peritonitis. There is plenty of evidence that certain cases of this type respond to the method. The treatment aids nature in transforming the general peritonitis into a localized infra-umbilical or pelvic collection of pus, which can then be treated safely by simple drainage.

Experience teaches us that simple drainage without removal of the appendix before this localization has occurred rarely saves the patient's life. Indeed, in many instances it appears to hasten the end. On the other hand, in most cases the expeditious removal of the appendix, together with suprapubic drainage, is, I believe, the best line of treatment in perforated appendicitis with general peritonitis, but the operation must be expeditious and the anaesthesia as perfect as possible. Should the operation prove to be difficult, necessitating considerable intra-abdominal manipulations, or if the attempt to remove the appendix has to be abandoned in favour of simple drainage, death usually follows. In these circumstances one must be prepared to state that such a case might have been saved by the delayed method.

In the light of the above remarks it is at least necessary for the surgeon to pause for a moment before advising immediate operation, and ask himself three questions:

1. Can I obtain for this case the services of an anaesthetist skilled in the administration of gas and oxygen?
2. Have I had sufficient experience to remove this appendix reasonably quickly if it is mobile?
3. Is it likely that this appendix can be delivered without much trouble?

No one can answer the last question with assurance, but one can say this much: *if the disease has been present for more than sixty hours it is practically certain that the appendix will be matted to neighbouring structures.*

Unless these questions can be answered satisfactorily immediate operation is contraindicated and perseverance with the delayed method in the hope of localization of the infections offers the patient his best chance.

There are two notable exceptions to this rule: (1) childhood and early adolescence; (2) when there is good reason to believe that the general peritonitis is due to the recent bursting of an appendix abscess. In childhood and early adolescence localization of a general peritoneal infection does not occur often enough to warrant a trial of the delayed method unless the circumstances are extenuating. If there is good reason to believe that the general peritonitis is due to the recent bursting of an appendix abscess simple drainage is a life-saving measure.

In the treatment of acute appendicitis with frank general (as opposed to pelvic) peritonitis there must be adequate reasons for adopting the method chosen. If those reasons

dictate delaying operation then the surgeon must be courageous, for in this instance it requires more courage *not* to operate.

Statistics.

Statistics of acute appendicitis are prone to be difficult to compile, for the notes on such a common condition are often scanty, and unless they are made by the statistician himself there is little uniformity in nomenclature. For want of a better term the busy house-surgeon often signs up as "acute appendicitis" cases in which an apparently normal appendix has been removed. Such examples are not rarities. These, together with subacute and a few recurrent cases, tend to swell the total number to be analysed. I have analysed for a period of two and a quarter years—from August, 1927, to November, 1929—cases of acute appendicitis treated by myself. During this period all cases in which the removed appendix was not definitely inflamed have been written up as "appendicectomy," as opposed to acute appendicitis, and have been discarded. I might also add that the notes on all the cases, with very few exceptions, have been made by myself.

Total number of cases of acute appendicitis	...	315
Treated by operation* within six hours of admission, including 24 with general or severe peritonitis	...	242
Died	...	4
Treated by the Ochsner-Sherren method	...	73
Died	...	1

* All patients with a gangrenous appendix received an intravenous injection of mercurochrome at the conclusion of their operation.

Analysing further the cases treated by the delayed method, in four cases removal of the appendix was undertaken whilst the Ochsner-Sherren treatment was in progress, owing to threatened failure of this treatment. Of these one died. In twelve instances an abscess required draining owing to failure of the abscess to resolve. Eight of these were drained in the right iliac fossa and four pelvic abscesses were opened into the rectum, all with recovery. This makes the total mortality for all cases of acute appendicitis during the period analysed about 1.75 per cent.

Analysis of Deaths.

Two died of intestinal obstruction following general peritonitis. One of these two months, and one two and a half months, after operation. Both the patients were little girls.

One patient died a few hours after admission following an operation for what was thought to be intestinal obstruction. At operation an appendix abscess containing about a pint of pus, with tremendous distension of the small intestine, was found. This death was hastened by an untimely operation due to a mistaken diagnosis.

One boy died two months after removal of an acute gangrenous unperforated appendix from pyelphlebitis with multiple liver abscesses. The patient had a rigor before operation, which I now look upon as a strong indication for tying the ileo-colic vein. Had this been done portal pyaemia might have been prevented.

A boy, aged 9, was admitted with general peritonitis of four days' duration. He was treated by the Ochsner-Sherren method for sixteen hours. His pulse then began to rise, and appendicectomy with suprapubic drainage was performed. Twenty-two days later he had a venous secondary haemorrhage from the wound, and improved after a blood transfusion. A few days later the haemorrhage again started. Further blood transfusion and laparotomy were performed. The haemorrhage was apparently coming from the superior mesenteric vein, but no bleeding point could be found to be ligatured. He died twenty-seven days after the first operation.

Conclusion.

I feel that the key to lowering the total mortality of appendicitis is to be found in the standardization of the type of case to be treated by immediate operation, together with the proper selection of patients for the Ochsner-Sherren treatment. This standardization is not yet final. I have tried to indicate a method of selecting cases for each form of treatment based upon the practice of my former master, who was a wise surgeon, for he knew when to operate and also when not to operate.

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