previously shut off the general peritoneal cavity, or if the perforation occurs on the outer side of or behind the caecum, an abscess forms. If, however, the appendix is free and in its usual position, perforation is at once followed by an acute spreading peritonitis.

Failure to appreciate the significance of the clinical phenomena associated with these pathological events has been responsible for many mistakes. A child during the first few hours of an acute attack of appendicitis suffers from severe abdominal pain, reflex vomiting, a rise of temperature, and a rapid pulse. These symptoms suddenly subside—the pain disappears, or almost so, the vomiting ceases, temperature and pulse fall, and the child looks and feels much better. Gentlemen, acute appendicitis never subsides in this way; it disappears by lysis and not by crisis. Sudden improvement means rupture of the appendical wall and relief of tension. It is of ominous import, and calls for immediate operation.

One other vexed question in connexion with appendicitis in children is whether an abscess should be operated upon early or late. An interesting correspondence upon this point appeared in the *BRITISH MEDICAL JOURNAL* about a year ago. It is well known that death from profound toxæmia and collapse may occur within a few hours of operation. This result followed operation in several children of distinguished parents, and created a painful impression. The explanation appears to be that the necessary manipulations lead to an exposure of raw surface from which a lethal dose of toxin is absorbed into the system. The doctrine that it is wise to defer operation in any case of appendical abscess is a dangerous one. The safe course is to open the abscess with a minimum amount of disturbance of tissue, to insert a tube, and to postpone removal of the appendix to a later date. The danger associated with these abscesses in children is, however, only another argument in favour of early operation. Such problems would rarely arise were it accepted that the diagnosis of acute appendicitis in a child carries with it the necessity for immediate operation.

The Middle-aged and Elderly.

As I have already stated, experience, supported by the statistics given, indicates that late operation is followed by an exceptional percentage of deaths in people above 40 years of age. The death-rate at the Queen's Hospital during the past five years has been nearly 35 per cent. This is due to the fact that the resisting and recuperative power of these patients is less, and the risk of complications such as pneumonia is greater, than in the case of younger persons. An acute attack of appendicitis in a middle-aged or elderly person, especially when stout, causes great anxiety to the medical attendant, who realizes that abdominal section in such cases is a very different procedure, as regards gravity, from what it is in the case of a young adult, and his natural inclination is to await developments rather than advise early operation.

I feel strongly that this delay is fraught with grave danger. The risk is almost entirely due to the disease and not to the operation. This is supported by the fact that no death occurred amongst 32 consecutive patients above 40 who were operated upon at the Queen's Hospital during a quiescent period.

In the case of healthy young adults a waiting attitude may be adopted with a certain amount of impunity. If the patient becomes worse, operation still holds out reasonable prospects of successful rescue. But in the elderly the conditions are very different; late operation fails to save in a far larger percentage of cases. It is essential to realize that a man whose condition to-day is so grave that operation would be attended by serious risk, not so much on account of his inflamed appendix, as on account of his age, his fatness, and his general lack of resisting power, will, if his disease progresses, be so ill to-morrow that the chances afforded by operation will be poor indeed. I have known many instances where delay in such cases has led to disastrous results. When the surgeon is forced to undertake a late operation because it is obvious that expectant treatment has failed, the patient almost always dies.

No, the position must be faced and the question of operation settled at an early stage. I have no fault to find with the man who decides at an early stage that in a particular case the whole chances of the patient are better without operation than with it, but I do most strongly

deprecate vacillation and postponement of decision until to-morrow. If worse, you cannot save your patient to-morrow. Realizing this fact, there are few cases where the decision will be against operation, and if decided upon, the earlier it is carried out the better. It seems to me that logically, in these cases, to operate as soon as a definite diagnosis of acute appendicitis is made is the only safe course. Only when operation, on account of the patient's general condition, would be attended by very grave risk should the rule be departed from, and then the decision against operation should be final.

In elderly people acute appendicitis manifests peculiarities which may lead to error. My experience is that the course of the disease is very insidious. The symptoms and objective evidence furnish no certain guide to what is going on inside. The temperature, pulse, and general condition often induce a false sense of security, which is rudely disturbed too late. It is not unusual to see a man lying comfortably in bed with a comparatively slow pulse, an almost normal temperature, and who expresses himself as not feeling ill, and who yet has a gangrenous appendix and a rapidly-spreading peritonitis.

In the elderly, as in children, the pathological condition is more often such that spontaneous recovery is impossible. It is common, even at an early stage, to find the appendix gangrenous in almost all its length and with little or no evidence of an attempt to localize infection. This probably accounts for the fact that the early reflex symptoms are so little marked. These precede gangrene and disappear when it occurs. In these cases I have almost invariably found the local condition worse than was expected, and have never had cause to regret early operation. For the reasons that in elderly people it is more difficult to estimate the gravity of the disease by the clinical phenomena, that resolution is less likely to occur, and that if serious complications do develop they cannot be successfully combated, I am of opinion that it is imperative to operate as early as possible.

THE OPERATION FOR ACUTE APPENDICITIS:

PRIMARY CLOSURE OF THE ABDOMINAL WOUND.

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At the discussion on the Treatment of General Septic Peritonitis which took place at the Annual Meeting of the Association in Birmingham last summer,¹ a discussion which was ably introduced by Professor Rutherford Morison, Newcastle, I—in the opinion of some of the subsequent speakers—had the temerity to make the following statement:

I desire to deal alone with the appendix as the *fons et origo mali* (of general septic peritonitis). The offending appendix—in this class of case usually gangrenous, and possibly perforated with an extruded concretion lying in its immediate neighbourhood—is removed in the usual fashion. The stump must be well buried. The bed of the appendix and the surrounding structures are swabbed with iodine (4 per cent.), mopped dry, and the gridiron wound, after similar treatment with iodine, is closed in layers. I am firmly convinced that this method of closure without drainage is sound surgery. It must be proved, however, to be not only as safe but safer than when drainage is employed. If the cause be removed much more can be left to the peritoneum than was formerly thought possible.

Seventeen cases were reported which had been dealt with in this fashion. One of these 17 cases died six hours after the operation; in 8 the wound healed primarily; in the remaining 8 there was some degree of septic infection of the wound. To obtain primary union at all with such a degree of intraperitoneal septic mischief was to me a revelation, and at the same time a stimulus to find some means of protecting the wound from infection.

In every case where the wound became infected, cutting free the superficial skin sutures was alone sufficient to check the progress of the infection.

I felt certain that in the above-mentioned cases the wound suppuration was the result of contamination by the infective material from within the abdomen, and that if one could prevent this infective material from coming

into contact with the divided and separated healthy tissues, or effectively sterilize these tissues after infection, then primary union should always take place. Within a few hours the peritoneal wound is sealed, and a re-collection may occur without wound infection. To prevent the wound from being soiled in these cases we found to be impossible, and we were compelled therefore to fall back upon the plan of wound disinfection.

In every case of primary appendicitis the damaged appendix is attacked—infected—from within its own lumen. The ever-present *Bacillus coli* finds in the devitalized organ a suitable nidus for its increased activity, and in the great majority of cases it is the predominating pus-producing organism present. Acting on this assumption, if we can by adopting any measures keep the infection from becoming a mixed one the virulence of the sepsis is lessened and the resisting power of the tissues encouraged. Hence the same precautions against the introduction of sepsis from without are as necessary as if one were dealing with an absolutely clean case. For these reasons I have been giving, either immediately before or immediately after the operation, 50 to 100 millions of a stock *Bacillus coli* vaccine, followed in ten days by a second dose, if necessary. This is given without testing the opsonic index.

Operative Procedure.

The abdomen is cleansed with spirit and painted with iodine. The gridiron incision is invariably employed—the skin, subcutaneous tissue, and aponeurosis of external oblique in one incision and at right angles to a line between the anterior superior spine and the umbilicus; the internal oblique, transversalis muscle, and fascia in a second incision at right angles to the first; and the peritoneum in a third incision in the same direction as the first. When circumstances do not demand it, why make a uniform large incision? Why divide and separate more tissue than is necessary? It means more damage to tissue and more raw surface to infect. An incision of 2 in. to 3 in. is, as a rule, ample. Having to rely upon disinfection as a means of securing primary union of the wound, we found, after experimenting with various antiseptics, that iodoform was best suited for this purpose, and was best in the form of an emulsion.

Before opening the peritoneum the emulsion is poured into the wound. This fulfils a double purpose: it brings an antiseptic into intimate contact with the freshly wounded surface, an antiseptic—iodoform—which has a particularly inhibitive effect upon *Bacillus coli* growth. The peritoneum is now opened.

The following cases might be considered in two groups; they were all acute cases—urgent cases: Group 1, where there was no localized collection of pus, and in which the appendix was gangrenous, in whole or in part, with or without perforation, and accompanied by a degree of septic peritonitis the actual extent or limit of which was unknown. Group 2, where there was a localized collection of pus shut off from the general abdominal cavity, and in which the appendix was to a varied extent in a condition of inflammatory destruction.

In Group 1, comprising five cases, four males and one female, the appendix was not shut off from the general cavity. In Cases i, ii, iii, iv (incipient), v (commencing) the appendix was in a condition of gangrene, and perforated in Cases i and ii. Free fluid of a foul-smelling, sero-purulent character was present in the general abdominal cavity more or less in all the cases, mopped from the pelvis through the appendix wound in Case i, and through a separate suprapubic opening in Case ii. The appendix was removed in each case. The emulsion in some quantity was poured into the seat of the appendix, and again into the wound, except in Case v, where biniodide and spirit were used for the wound. The gridiron wound in each case was closed without drainage.

In Group 2, comprising two cases, vi and vii, there was a localized collection of pus. The gridiron wound was treated in the same manner as in Group 1. The general cavity was protected by strips of gauze before separating the adherent bowel. The pus was carefully mopped out, the appendix removed, the resultant cavity filled with emulsion, the wound closed in layers without drainage, painted with iodine, and sealed with collodion. In Case vii there was an opening in the sheath in the iliacus muscle,

about the size of a shilling piece, leading to a collection of pus in the muscle.

The Question of Drainage.

In these consecutive seven cases in which drainage would in each case have been previously adopted either by tube or by packing, a primary healing of the wound has occurred. In Case ii, owing to the retro-caecal position and the amount of interference necessary to remove the appendix, I admit my faith wavered, and I made a separate opening behind, and placed a tube for forty-eight hours. This served no purpose as far as drainage was concerned, for nothing came through the tube except a little blood-stained serum. Whether these striking results are due to the vaccine or to the iodoform emulsion, or to both or to neither, I cannot say. It is interesting to consider the question of drainage in abdominal conditions from a historical point of view. Not many years ago it was the routine practice to place drainage tubes in both flanks and in the pouch of Douglas in all cases of perforative stomach and intestinal lesions. With the advent of the Fowler position the flank drainage tubes disappeared, and now the use of a suprapubic drain is considered unnecessary. I never employ now a post-operative suprapubic drain or any drain whatever in perforative stomach or intestinal cases. After mopping out the pouch of Douglas the suprapubic wound is closed.

Risks.

What risks are run by primary closure of the appendix wound when the offending organ has been efficiently removed?

1. A peritonitis which has been confined to a circumscribed area around the appendix might become general. In the cases here reported, and in others previously reported, a septic peritonitis existed at the time of the operation. It may be argued that the peritonitis was, in these cases, limited in extent, confined to the pelvis. In no case, however, did it subsequently become general. In my opinion, if the resisting powers of the tissues themselves be not sufficient to prevent extension of the peritonitis drainage will not help them.

2. Extension of the septic process may occur along the colon or into the pelvis, and a subdiaphragmatic abscess form as a result of the former and a pelvic abscess as the result of the latter. Certainly each of these conditions may happen, but each has happened when free drainage has been employed. No opinion on this point is of value until a comparison be made between the cases treated with and without drainage. The same applies to septic thrombosis and pyaemia.

3. A localized abscess may form at the appendix region itself. This could be treated as in the primary lesion. I have not yet experienced it.

4. Infection of the wound. Up to the present series this has happened in 50 per cent. of my cases, and in each case the infecting organism was *Bacillus coli*. Since the employment of vaccine and of the emulsion only a small infection occurred in one case (Case ii).

The advantages of primary union are so apparent that they need not be elaborated. The possibility of subsequent hernia is reduced to a minimum. The formation of a faecal fistula is not encouraged. On this point I have no doubt whatever; when I employed a drainage tube a faecal fistula was not an uncommon complication. The fistula may not have lasted for long, but it retarded convalescence. Since I ceased employing a drainage tube no faecal fistula has occurred.

One word with regard to immediate after-treatment. I do not think it advisable to hasten the administration of a cathartic. If there is some distension or peristaltic pain a turpentine enema usually gives relief. An interval of four to seven days is best before the usual post-operative laxative is given.

Though I have in this communication advocated the abolition of the drainage tube as a routine method of procedure in all cases of operation in acute appendicitis, I freely admit that, in the words of Professor Gilbert Barling at the close of his remarks on the treatment of general septic peritonitis, we "should adopt no hard and fast line of treatment, but treat each case on its own merits." I would add, in extenuation of "early closing," my belief in the words of Professor Rutherford Morison, "that the

peritoneum has a resisting power not belonging to other tissues."

For the reports of the following cases I am indebted to my former house-surgeon, Dr. Charles Cameron, whose kindly help I heartily acknowledge.

CASE I.

W. M., male, aged 9, admitted to the Victoria Infirmary, Glasgow, on February 14th, 1912, suffering from urgent abdominal symptoms of three days' duration. Symptoms consisted of abdominal pain, at first diffuse, but settling later in the right iliac region. On morning of admission, while straining at stool, his pain became suddenly very violent, and on admission was very severe. On admission temperature was 101°; pulse 100 and very weak. Face was flushed, and tongue covered with a dirty white fur. He complained of generalized abdominal pain, most severe over McBurney's point and in right hypochondrium. Abdominal rigidity, tenderness, and hyperaesthesia were intense, especially in right iliac region.

Operation (Mr. Grant Andrew).—Usual appendix incision—gridiron—and use of iodoform emulsion. Abundant foul-smelling, sero-purulent fluid escaped. Appendix lay to the outer side of the caecum, pointing up towards the liver. It was densely adherent to caecum. Adhesions separated and appendix removed in the usual way. Sero purulent fluid was mopped out of the pelvis through the appendix wound with long strips of gauze pushed down on long forceps. More emulsion was poured into the appendix bed and into the wound, which was completely closed in layers. The appendix was perforated near the tip, and actual spurts of faecal matter were seen issuing during the operation. It was long and gangrenous, and contained four coproliths. He received after operation 50 million injection of *Bacillus coli* vaccine. Wound healed by first intention, and he was dismissed well on March 2nd, 1912—eighteen days after operation.

CASE II.

S. T., male, aged 28, admitted to the Victoria Infirmary, Glasgow, on February 23rd, 1912, with symptoms of four days' duration. On admission he was very collapsed and toxic. Temperature was 99.6°; pulse 116, small and thready. Complained of severe abdominal pain. Abdomen was distended and rigid, rigidity and tenderness being exquisite in the right iliac region.

Operation (Mr. Grant Andrew).—Usual appendix incision and emulsion. A great quantity of purulent *Bacillus coli* fluid, containing yellowish flakes of lymph, escaped. Appendix lay retrocaecally, and was densely adherent to the posterior aspect of the caecum and the posterior abdominal parietes. It was partly brought into the wound, but owing to its extreme friability it broke off and the stump was withdrawn into the abdomen. To obtain room for finding the stump the internal oblique was divided in an upward direction. In the search two coproliths were found free in the abdomen and were removed. The appendix stump was found after a long search and dealt with in the usual manner. A lateral incision was then made and a drainage tube passed in behind the caecum. The gridiron wound was completely closed in layers after fresh emulsion had been poured in. A small suprapubic incision was made and the pelvis mopped out with gauze. This wound was closed completely. One hundred million *Bacillus coli* was given immediately after operation. Tube was removed in two days' time. Very slight infection occurred at the upper angle of the gridiron wound. This closed up quickly, and did not in any way impair the strength of the wound. He was dismissed well on March 23rd, having been twenty-nine days in hospital.

CASE III.

J. G., male, aged 25, admitted to the Victoria Infirmary, Glasgow, on February 24th, 1912, with abdominal symptoms of sixty hours' duration. He had had two previous attacks of appendicitis. Very ill on admission and very toxic. Face was pale and tongue dry and furred. Temperature was 100.1°, and pulse 110 per minute. Abdominal pain was generalized, but very severe in the right iliac region, where rigidity and tenderness were exquisite.

Operation (Mr. Grant Andrew).—Usual gridiron incision and use of emulsion. Appendix lay over the external iliac artery and pointed towards the pelvic brim. Removed in the usual manner. Emulsion applied to the appendix bed and to the wound, which was completely closed in layers. Appendix was thick and gangrenous in its whole extent, with a stricture near the base. It was full of faecal matter, contained one coprolith, but was not perforated. Wound healed by first intention, and he was dismissed well on March 16th, twenty-one days after operation. Fifty million of *Bacillus coli* vaccine was given on admission.

CASE IV.

C. H., male, aged 20, admitted to the Victoria Infirmary, Glasgow, on March 16th, 1912, suffering from abdominal symptoms of thirty-six hours' duration. On admission he looked very ill. Face was flushed, skin cold, and covered with a clammy sweat. Tongue was furred. Temperature was 98.2°, and pulse 88 per minute. Abdomen was rigid and hyperaesthetic, especially in the right iliac region.

Operation (Mr. Grant Andrew).—Usual gridiron incision and use of emulsion. Appendix lay to the inner side of the caecum, coiled on itself, with tip hanging over the pelvic brim. There were numerous adhesions round the base. It was removed in the usual manner. There was no free fluid. Appendix was

rough on surface, suggesting tubercle, not so microscopically. Mucous coat was very dark, suggesting incipient gangrene. There were two areas, one at the base and one at the tip, over which the coats were thin and where perforation would probably have occurred. Wound healed primarily. Dismissed April 6th, three weeks after operation. Fifty million of *Bacillus coli* was given on admission.

CASE V.

Mrs. F., aged 27, admitted to the Victoria Infirmary, Glasgow, on February 10th, 1912, suffering from abdominal symptoms of two days' duration. Abdomen was very rigid and hyperaesthetic, especially in the right iliac region. Temperature was 100.5°; pulse 104.

Operation (Mr. Grant Andrew).—No emulsion was used here, but wound was swabbed with mercury biniodide and spirit. Appendix was long and pointed towards the pelvis. It was covered with dirty green exudate, contained three coproliths, and showed commencing gangrene at the base. Wound healed perfectly by first intention; it was closed in layers without drainage. She was dismissed on March 1st, having been three weeks in hospital. Fifty million of *Bacillus coli* vaccine was given immediately after operation.

CASE VI.

Mrs. W., aged 43, admitted to the Victoria Infirmary, Glasgow, with symptoms of eight days' duration. Symptoms consisted of abdominal pain, at first diffuse but settling later in the right iliac region. The pain was accompanied by sickness but no vomiting. On admission she was very ill and toxic. A large tense, doughy, tender swelling was palpable over the appendix region. Temperature was 101.1°; pulse 100.

Operation (Mr. Grant Andrew).—Usual gridiron incision and use of emulsion. Distended caecum bulged into wound. This was pushed inwards and a gush (about 2 oz.) of thick yellow, localized *Bacillus coli* pus escaped. The cavity was mopped out. Appendix lay retrocaecally and was buried in the abscess wall. It was removed with great difficulty. Cavity was filled with iodoform emulsion and the wound was completely closed in layers. Some induration and redness of the edges of the wound formed, but this subsided and the wound healed perfectly by first intention. Fifty million of *Bacillus coli* vaccine was given on admission and again on April 8th. She was dismissed well on April 20th, having been three weeks in hospital.

CASE VII.

A. R., female, aged 41, admitted to the Victoria Infirmary, Glasgow, on April 6th, 1912, as an urgent case with history of abdominal pain and sickness of six days' duration. She was very ill on admission. Temperature was 100.5°; pulse was 104. A big mass was palpable in the appendix region.

Operation (Mr. Grant Andrew).—Usual gridiron incision and use of emulsion. Bowel was adherent to anterior abdominal wall. This was separated and pus escaped in huge quantity, particularly from a circular opening in the iliacus sheath. Appendix lay retrocaecally. It was removed in the usual way. Emulsion was poured in and the wound closed in layers and sealed with collodion. Wound healed completely by first intention. Fifty million *Bacillus coli* vaccine was given on admission and again ten days after.

REFERENCE.

¹ BRITISH MEDICAL JOURNAL, October 28th, 1911.

WE have received the prospectus of a new medical index which is about to appear in monthly parts under the title of *Bibliographische Monatsschrift*. It is described as an international journal of all medical literature. It is published by the Claudius Verlag (Amandus M. F. Martens) at Wandsbeck i. H. Each part will contain about 80 pages of printed matter, and the price will be 30 marks or 20 marks for cash. According to the prospectus, the publication will contain the titles and authors of all newly published medical books and the titles and authors of every article in the various medical journals throughout the world. The aim is to make it more complete than the *Index Medicus*, which does not include every individual article in the journals. There are two aspects from which we can regard this publication. The first is highly practical and is covered by the question, "Is there a sufficient demand for such a publication?" We have been threatened so often with the withdrawal of the *Index Medicus* on the ground that the expense of production is very heavy and can only be covered by a large subscription list, that we are somewhat sceptic as to the chances of an additional index finding sufficient supporters, even though it be fuller than the old one. The second point concerns the manner in which the material will be dealt with. Presuming that the publishers' intentions are carried out fully and every article and other publication is given in the *Monatsschrift*, the utility of the work will depend entirely on the arrangement of subjects; the mass of medical literature is so overwhelming, that unless some practical scheme of classification is adopted, the reference value would be small. If the work proves to be really what it claims to be, it will be of great use to medical men who wish to keep themselves informed about the publications on special subjects.