INTERVAL OPERATIONS IN APPENDICITIS, CHIEFLY FOR RELAPSE, WITH A TABLE OF CASES.*

By GILBERT BARLING, M.B., F.R.C.S.,

Co-Professor of Surgery in Mason College; Surgeon to the Birmingham General Hospital.

IN the year 1892 I read before this Branch a paper on appendicitis, since which time until quite recently I believe no formal communication has been made on this subject to the Branch, though from its extreme importance it has greatly occupied current medical literature and medical societies. I do not propose to-day to consider appendicitis in all its phases: the ground to be occupied is too extensive for the time at my disposal, and general discussion becomes too diffuse. My purpose is rather to focus attention upon relapsing cases and operation in the period of quiescence, or, to use a phrase which seems to have found favour in America, upon "interval operations."

Whilst everyone is familiar with the fact that patients do have repeated attacks of appendicitis, variously spoken of as relapses or recurrences, no reliable data are forthcoming as to the proportion of patients who suffer in this way. This lack of information arises probably from various causes. Consulting physicians and surgeons are often unable to follow out their cases either in hospital or in private practice as persistently as is necessary to arrive at a definite conclusion; those who are occupied in family practice see only a limited number of cases, too few to furnish the number requisite to settle the question. Another difficulty arises from what I believe to be a fact—namely, that the less severe cases come to the care of the physician and the more intense to the care of the surgeon; and the experiences of the two show considerable divergence.

Without pretending to give the actual proportion of patients who suffer from relapse, I may say that certainly more than a third of the patients I have operated upon for appendicitis have had more than one attack, and in a few cases the relapses have spread over a number of years, a condition eventually arising which imperatively demanded surgical interference. I may also add that it would have been greatly to the advantage of these patients if they could have been operated upon during a period of quiescence, for their risk would have been less and their future comfort would have been promoted by a wound healing by first intention, and a firm scar, instead of that which they have had to be content with, namely, a wound which, owing to suppuration, could not be securely closed at the time, with the formation of a scar which eventually became the seat of a hernia.

The results of relapse are, besides the mortality which occurs, repeated invalidism, and in a few cases severe interference with nutrition. I have seen it suggested that the mortality from relapses is inconsiderable, but this by no means accords with my experience. Fatalities occur quite frequently in these cases, and it is important to bear in mind that a mild attack in the first instance, or in the second or later attacks, is often followed by a severe one, which may bring about the patient's death.

Repeated invalidism, too, is a matter of no small importance to those who have to earn their living, as each attack will prevent the patient working for days or weeks at a time. Interference with nutrition to a marked degree is not often noticed, but Cases 1 and 3 were severe examples of this kind.

The conditions found as explaining the tendency to relapse are various. Perhaps the commonest is malposition of the appendix with distortion and adhesions; the next most common is the presence of concretion; complete stenosis occurs not infrequently; and a fourth condition, and one that carries with it perhaps unusual risk, is the presence of abscess, of which there is no indication. Which of these is present in any given case is generally only a matter of conjecture. If it were possible to diagnose between the conditions I have spoken of, we should be able to separate the

more dangerous cases with abscess or concretion from the less dangerous, and operate upon the former without any delay whatever, whereas in the latter delay would be more excusable. It is not difficult to explain how the pathological changes above mentioned should give rise to recurrent attacks of appendicitis. Malposition, distortion, and adhesion of the appendix prevent the emptying of its narrow cavity into the cæcum, putrefactive changes being thus favoured by stagnation of its contents. The part played by concretion is probably this: by pressure on the walls of the appendix in which an infective inflammation has been set up, necrosis of the part pressed upon is produced, and from this perforation. It is quite certain that concretions may remain innocuous for years in the appendix until some accidental change makes them potent for harm, and this accident may occur at any time. Stenosis of the appendix is the result of previous inflammatory attacks, and the distal portion may undergo dilatation at any time with thin mucus or pus, and when thus distended is an ever present danger to the patient. A remarkable instance of this kind is to be found in the Mason College Museum: a stenosed appendix is dilated to the size of the thumb, and after many attacks of appendicitis the patient eventually succumbed to leaking from the dilated portion.

Unrecognised abscesses may give rise to fresh attacks as the subjects of them begin to move about, either because the adhesions become torn or stretched by muscular movements, or, by the action of underlying or of overlying muscles, the infective pus may be driven into the adjacent lymphatics. Of the possibility of these abscesses rupturing and giving rise to an immediate diffuse, septic peritonitis, numerous examples could be quoted.

Whilst the local conditions in and around the appendix of which I have just spoken are the predisposing causes which bring about the attack, they are lighted up into activity very generally by catarrh of the colon extending to the vermiform appendix. The catarrh is excited either by cold or by imperfectly-digested food, and when it has spread into the appendix the mucous membrane here becomes swollen and softened, so as to block its orifice more or less completely. The appendix is prevented by adhesion from expelling its contents, and we thus have a stagnant fluid containing the colon bacillus which kept at rest grows luxuriantly, invades the walls of the appendix, and may pass through them to the parts around, giving rise to peritonitis, or to suppuration local or diffused.

The important question which we may all have to answer decisively is, When should operation be resorted to, how many relapses are to be waited for? The answer to this varies somewhat with the age and social position of the patient. In young children the risk of perforation or gangrene of the appendix, or of some other fatal accident, is greater than in adults, and for this reason I incline to advise operation after one really severe attack.

In the adult unless there is some special reason against it, I am willing to wait till the second definite attack has occurred, and then I advise operation, always assuming that the patient has been treated properly, not only by diet and medicine, but by prolonged rest after the first attack. In hospital cases, even in adults, I occasionally advise operation after the first attack if it has been a severe one, and the patient's occupation involves him in hard work or exposure, or if the patient, though free from fever and with a satisfactory improvement locally, yet has an appearance of not doing well—if I may put it so, is not thriving.

To reiterate what I have said above, if one could tell the exact condition in and around the appendix, one would be willing to wait for repeated attacks when there is merely adhesion and distortion of the appendix; but as we cannot tell whether pus is present or not, or whether a concretion exists, to remove patients from danger I feel compelled to advocate interference with the moderate amount of delay I have outlined above. As enforcing this lesson I should like especially to lay stress on Cases 7, 12, and 17.

To justify these interval operations it is necessary that they shall be attended with a very small mortality, and they must be free from any secondary trouble such as hernia at the site of the incision. As to rate of mortality, Treves has published a list of more than a hundred cases in which the mortality

* Read at a meeting of the Birmingham and Midland Counties Branch of the British Medical Association.

Table of Interval Operations for Appendicitis.

No.	Hospital or Private.	Sex.	Age.	Number of Attacks.	Date of Operation.	Conditions Found.	Result.	Remarks.
1	H.	M.	22	Several	Sept. 14, 1892	Very dense widespread adhesions, no concretion or stricture in appendix	Recovery	Drained. Threatened hernia in 1897, due possibly to straining, patient having stricture of the urethra.
2	P.	M.	7	4	Apl. 20, 1894	Small abscess, much distortion of appendix	"	Whole of omentum divided, releasing transverse colon. Complete relief of symptoms.
3	P.	F.	64	Several	Jan. 7, 1896	Very dense matting of omentum and intestine. appendix not found	"	Fluid in appendix and free fluid in abdomen sterile on cultivation.
4	H.	M.	18	2	Feb. 10, 1896	Moderate adhesion. Double stricture of appendix	"	No pus, concretion, or stricture of the appendix. Fluid in it sterile on cultivation.
5	H.	F.	32	4	Feb. 17, 1896	Appendix found on brim of pelvis, in mass of adhesion close to right ovary	"	No pus, concretion, or stricture. Recovery interrupted by slight femoral phlebitis (left).
6	P.	M.	32	3	Feb. 20, 1896	Appendix to front and outer side of cæcum moderately adherent	"	Considerable matting. Appendix stenosed and containing three concretions
7	P.	M.	26	3	Apl. 14, 1896	Appendix densely adherent under cæcum. It was perforated, and a small abscess lay around it	"	Appendix herniated into ileo-cæcal pouch and densely adherent
8	H.	F.	23	5	Apl. 27, 1896	Appendix densely adherent to outer side and back of cæcum	"	Appendix adherent in pelvis, with a concretion near cæcal end
9	P.	M.	43	3	May 15, 1896	Appendix lay in an abscess behind cæcum, no concretion or stricture	"	Appendix at inner side cæcum, densely adherent except at tip, which was free and dilated beyond a stricture. A few drops of pus around appendix
10	P.	M.	32	4	June 2, 1896	Abscess around base of appendix which contained a concretion	"	Appendix to outer side of cæcum and behind it. stenosed at free end
11	H.	M.	20	3	Nov. 16, 1896	Appendix densely adherent, and running over iliac vessels into pelvis	"	Appendix running from cæcum into an abscess in pelvis. It was perforated and a concretion was found in the pus
12	H.	F.	22	1	Jan. 25, 1897	Appendix perforated at its base, and small abscess surrounding it	"	Appendix spirally coiled on itself and small abscess around it
13	P.	F.	—	2	Feb. 5, 1897	Appendix behind and to outer side of cæcum. Moderate adhesions	"	Appendix only slightly adherent. Strong adhesions of omentum to parietal peritoneum
14	H.	M.	—	2	Feb. 22, 1897	Appendix very short, adherent to cæcum, and containing a concretion, numerous adhesions of omentum to parietal peritoneum	"	Appendix to inner side of cæcum, and densely adherent to small intestine which lay over it
15	H.	M.	20	3	Mar. 15, 1897	Appendix densely adherent, and running over iliac vessels into pelvis	"	Appendix behind and to outer side of cæcum. Moderate adhesions
16	P.	M.	59	2	Mar. 18, 1897	Appendix running from cæcum into an abscess in pelvis. It was perforated and a concretion was found in the pus	"	Appendix very short, adherent to cæcum, and containing a concretion, numerous adhesions of omentum to parietal peritoneum
17	H.	M.	15	1	Apl. 12, 1897	Appendix perforated at its base, and small abscess surrounding it	"	Appendix spirally coiled on itself and small abscess around it
18	H.	F.	36	3	May 31, 1897	Appendix behind and to outer side of cæcum. Moderate adhesions	"	Appendix only slightly adherent. Strong adhesions of omentum to parietal peritoneum
19	H.	M.	23	2	July 29, 1897	Appendix very short, adherent to cæcum, and containing a concretion, numerous adhesions of omentum to parietal peritoneum	"	Appendix to inner side of cæcum, and densely adherent to small intestine which lay over it
20	H.	M.	30	Several	Oct. 1, 1897	Appendix densely adherent, and running over iliac vessels into pelvis	"	Appendix running from cæcum into an abscess in pelvis. It was perforated and a concretion was found in the pus
21	H.	M.	14	1	Oct. 4, 1897	Appendix perforated at its base, and small abscess surrounding it	"	Appendix spirally coiled on itself and small abscess around it
22	H.	M.	44	3	Nov. 15, 1897	Appendix behind and to outer side of cæcum. Moderate adhesions	"	Appendix only slightly adherent. Strong adhesions of omentum to parietal peritoneum
23	H.	M.	36	2	Nov. 26, 1897	Appendix very short, adherent to cæcum, and containing a concretion, numerous adhesions of omentum to parietal peritoneum	"	Appendix to inner side of cæcum, and densely adherent to small intestine which lay over it

was less than 1 per cent., and other surgeons have shown similar happy results from smaller series of cases. My own experience goes to confirm this, for all my 23 cases, of which you have a list before you, fortunately recovered, and they include many cases in which the operation was severe, the age of the patients varying from childhood to over 60.

The question of hernia is by no means an unimportant one, for it brings with it in some cases inconvenience and occasionally danger. Whether hernia is to occur or not depends greatly upon the question whether the wound can be closed entirely or whether it must be drained. Drainage is required only where pus exists, and not always then; but when it is employed undoubtedly the scar is more likely to yield. If, however, the wound is properly planned, muscular tissue is divided as little as possible, the tissues are carefully sutured, the patient is kept at rest in the horizontal position for at least four weeks, and the abdomen is supported for a few months with a properly-fitting belt, then my experience leads me to believe that hernia is very exceptional indeed.

The most suitable time for operation is about three weeks after the commencement of the attack; when all acute symptoms have disappeared and the temperature and pulse have become normal. If operation be performed earlier than this, the vascularity of the parts produces troublesome oozing in the process of separating of adhesions, whilst if the time be considerably prolonged there is the disadvantage that the adhesions have become much tougher and harder to separate.

The method of operation has received a great deal of attention, and the way in which the abdominal wall should be

incised has been discussed almost *ad nauseam*. Where circumstances permit, a very good incision is the vertical division of the skin outside the semilunar line, division of the aponeurosis of the external oblique in the same line, then a transverse separation of the muscular fibre, and a vertical division of the fascia and peritoneum. This in operations which require only a moderate amount of manipulation is excellent, but it appears to have been followed occasionally by atrophy of the rectus from division of its nerve supplies derived from the ilio-hypogastric nerve. Another incision is one to the inner side of the semilunar line, opening the anterior layer of the sheath of the rectus, pulling the muscle inwards without division, then incision of the posterior layer of the sheath. When the wound is closed the fascial layers are carefully united by sutures, and the muscle falls back into its place and remains unweakened; my attention was called to this incision by my friend Mr. Bowlby, though I do not know whether he originated it. Whilst holding that as far as possible incision such as I have described should be adopted, I think any operator does well not to be unduly bound by these if the appendix lies somewhat out of the ordinary position, or if the parts indicate by their condition that more than a usual amount of manipulation is to be expected.

The abdomen once open, care should be taken at once to pack sponges inside, so that if in the process of manipulation pus is liberated it will be prevented from soiling the rest of the cavity. In seeking the appendix there is no guide so reliable as the longitudinal muscular bands of the cæcum;

these should be followed persistently. Some adhesions are quite soft and easily separated, others are extremely tough and difficult to get through; the operator must work firmly yet circumspectly or he will get into trouble, especially with tissues like the walls of intestine infiltrated with inflammatory material. In one case I tore a small hole in the cæcum, but it was easily repaired, and no harm ensued. In two other cases—Nos. 1 and 9—the adhesion was so dense that the inner coats of the appendix stripped from the outer in great part, but there was no drawback in this, as the essential portion (the mucous coat) was removed. It seemed likely that the symptoms in Case 3, in which the appendix was not removed, were due to the drag on the transverse colon, and acting on this view I ligatured and divided all the omentum, thus releasing the colon, and the patient obtained complete relief from her symptoms. If pus is found, the sponges placed in the abdomen prevent infection of more distant parts, but it must be mopped up as speedily as possible, and the walls of the cavity in which it lies thoroughly cleansed.

In dealing with the stump of the appendix, if its tissues are not much infiltrated it is easy to make a flap of the peritoneum, which can be stitched so as to cover the stump, but when the parts are a good deal infiltrated this cannot be done, nor is it necessary to insure a satisfactory result. In the majority of my cases I have been content to ligature the appendix close to the cæcum, and after dividing it have applied pure carbolic acid to the little patch of mucous membrane exposed, and finally, at the end of the operation, have tucked the end underneath the cæcum.

If there is much pus present it will be well to drain, the safety of the patient being the first consideration, but as this undoubtedly leaves a great tendency to hernia, it should be resorted to only after careful consideration. I find my own tendency now is to drain less frequently than I formerly did.

However well a patient does, I think he should spend four weeks in bed, in the horizontal position, so as to allow the recently-united tissues to become firm before any strain is put upon them, and in all cases I advise for a time the wearing of a well-fitting belt.

As before mentioned, all my cases have recovered; they have all been completely relieved of their symptoms, and as to hernia, I have satisfied myself, either by personal examination or by inquiries from the medical attendants, that only one patient suffered from hernia where the wound was completely united by sutures. In this case there was an abscess round the appendix, but I closed the wound without drainage. Unfortunately the incision became infected, probably from the abscess, and suppurated, leaving a weak scar, which has since yielded (see Case 18).

Even with an operation which has very little risk and which cures constantly, patients will require an alternative, at all events for a time, until experience of repeated attacks tells them that they had better get rid of the offending organ. The alternative is prolonged rest in the horizontal position, with careful dieting, and such medical treatment as may be required. With prolonged rest undoubtedly a few cases get well, but there is no certainty about this alternative, and rest, even if prolonged for two or three months, may not produce a cure. The patient must have this fairly put before him, or he is apt to resent the care that has been bestowed upon him if, after resting a good many weeks, a period of activity is followed by a further relapse.

As bearing upon this, I may point out that in Cases 6 and 9, in both of whom only a fixed adherent appendix was found, pus and concretion being absent, relapse occurred whilst the patients were still resting in bed.

MR. WALTER A. S. BRIDGEFORD, M.R.C.S., L.R.C.P., of Boulder City, West Australia, has been appointed a magistrate for the East Coolgardie District.

THE medical profession in this country will learn with great regret that Dr. Joseph J. O'Dwyer, of New York, whose name is associated with intubation in laryngeal diphtheria, is dead. He was suffering from tuberculous meningitis, the diagnosis having in the first instance been made by Dr. O'Dwyer himself. He was 55 years of age.

ON THE ULTIMATE FATE OF PLACENTAL TISSUE RETAINED IN UTERO.

By W. E. FOTHERGILL, M.A., B.Sc., M.D.,
Manchester.

IN the BRITISH MEDICAL JOURNAL of May 9th, 1896, I figured and described five microscopic sections of placental tissue which showed that, after the foetal circulation has ceased, no constructive process continues in the foetal elements of the placenta; that the epithelium of the chorionic villi degenerates and disappears, the connective tissue of the villi more slowly losing its identity; that the maternal blood occupying the intervillous spaces first clots and then becomes organised, rendering firm and tough the originally spongy placenta. At that time I was not able to explain fully the processes which occur in placental tissue retained *in utero* after the death or expulsion of the foetus. Since then, however, I have been fortunate in obtaining some good specimens from cases of missed abortion and incomplete abortion, that is to say, some fleshy moles and placental polypi, which have enabled me to clear up the question.

Though uterine moles have often been described from the times of Hippocrates, Aristotle, and Galen onwards, the literature of this subject continued for several centuries to be more amusing than instructive. Morgagni,¹ however, perfectly understood the gross pathology of retained ova, as have most subsequent writers. Scanzoni² says that the thickness of the chorion in a retained ovum is due to the effused blood, more or less organised, which is found between the villi. This, he continues, becomes transformed into connective tissue, which becomes vascular and adheres to the uterine wall. Upon this statement little advance has been made. Though an enormous number of cases of retention of the products of conception has been recorded from a clinical standpoint, more especially during the last few months, the authors seem content with the statement that, upon microscopic examination of their specimens, chorionic villi were found. Budin³ and Breus⁴ both wrote papers on the subject in 1892, which I have already reviewed somewhat critically in the *Manchester Medical Chronicle*, n. s. 6, 1897. Berry Hart,⁵ at the Carlisle meeting in 1896, described two cases, giving microscopic appearances similar to those figured by myself in the BRITISH MEDICAL JOURNAL of May 9th, 1896. Papers by Neumann⁶ and others published during the last year give no further information.

The results of my recent work are as follows: After the foetal circulation ceases, the small foetal blood vessels of the placenta quickly disappear entirely, the larger ones being more slowly obliterated, and leaving for some time a few blood crystals and amorphous granules to mark their position. The foetal connective tissue between the epithelial layers of the amnion and chorion, as also that forming the cores of the villi, is compressed, but is not otherwise altered for a long time.

The foetal epithelium covering the amniotic surface of the placenta remains recognisable for a long time; the cell outlines, however, are lost, and the nuclei become clouded. The foetal epithelium of the chorion covering that membrane itself and the villi which spring from it also loses its cell outlines, and its nuclei soon cease to stain clearly. Meanwhile a great change occurs in the maternal circulation. The space between the uterine wall and the chorion coextensive with the placenta is crossed by numerous villi, while innumerable smaller villi hang freely from the chorion without reaching the surface of the decidua. Into this great intervillous space maternal blood flows from the uterine wall during the life of the foetus, and returns into the maternal vessels after circulating amongst the villi. When the epithelial covering of the villi degenerates after the stoppage of the foetal circulation, the maternal blood in the intervillous space does not long continue to move, but soon forms a firm blood clot embedding the villi. This intervillous blood clot consists so largely of fibrin that it is probable that the degenerated epithelium of the villi acts as a foreign body, layer after layer of fibrin being deposited upon it from the maternal blood until the whole intervillous space is thrombosed. Eden⁷ has shown that this occurs in parts of m-