THE LETTSOMIAN LECTURES ON PERITONITIS.

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LECTURE III. PART II.—THE TREATMENT OF PERITONITIS.

(Concluded from p. 458.)

BEFORE dealing in detail with this matter a very brief reference may be made to the treatment as carried out in bygone years. Inasmuch as peritonitis, as an individual disease, was not recognised until the beginning of the present century, even the most elaborate review of the subject cannot extend very far back.

An excellent account of the treatment of the disease as practised in England eighty years ago is to be found in a gossiping tract on *Peritonitis*, by Thomas Sutton, M.D., late Physician to the Forces, and Consulting Physician to the Kent Dispensary.¹² His lines of treatment were as follows—first, absolute rest; second, purgatives; third, abstinence from food; fourth, cold to the abdomen; fifth, bloodletting in the acute cases; and sixth, opium to be given only occasionally and very sparingly. Dr. Sutton was not a believer in opium in peritonitis, except in the presence of intense pain. He made a great point of securing an action of the bowels when possible, and made frequent use of sulphate of magnesia. Benjamin Travers, writing in 1812, advocated the same measures. He considered an evacuation of the bowels to be a matter of primary importance, but he appears to have relied largely upon enemata, and to have inclined towards warm fomentations.

The history of the surgical treatment of peritonitis is well given in the article on peritonitis in the *Dictionnaire Encyclopédique des Sciences Médicales*. Its modern developments are too well known to need detailing. Some credit in the past must be given to Jobert, who, in 1836, advised that in peritonitis with effusion the abdominal wall should be incised and water at blood heat injected. Guérin, ten years later, recommended a copious washing out of the abdomen in generalised puerperal peritonitis. The peritoneal fluid was, however, to be drawn off with an aspirator, and warm water injected and withdrawn until it came back clear.

In considering the treatment of any grave affection it is well to recollect that certain of the so-called symptoms of a disease are not crass evidences of a disturbing evil within the body, but are rather the natural expression on the part of the organism of an attempt to rid itself of a trouble. Many symptoms are, in fact, curative acts, and are the measures of a natural treatment, and not the mere purposeless signs of an unnatural disturbance.

The cough and expectoration in bronchitis afford a means of ridding the lung of the products of a catarrh, set up in the bronchi by some irritant. The photophobia and lachrymation in ulcer of the cornea serve to keep the inflamed part moist and to protect it from the irritation of exposure and of light. The vomiting in poisoning has for its purpose the evacuation of the substance which has caused the disturbance. In any one of these cases the treatment consists, not in an attempt to suppress these symptoms, but in an endeavour to encourage them.

In peritonitis the exhaustion, the rigidity of the belly wall, the pain, the vomiting, and the not infrequent sense that the bowel needs to be emptied of flatus would suggest the recommendation of absolute rest, of attempts to relieve pain, of starvation, and, under certain circumstances, of means to relieve the intestine. If, in contemplating a patient with peritonitis, one could regard his more conspicuous symptoms as natural attempts to afford relief, they would appear to be in the direction of securing quiet within the enclosure of the abdomen and of effecting an evacuation of the alimentary canal. In the account which follows of the treatment of peritonitis this suggestion from the therapeutics of Nature is not disregarded.

I.—REST.

Absolute rest in the recumbent position appears to be the first obvious indication. The knees may be flexed over a pillow to lessen the tension on the abdominal walls, and to favour the patient's instinct to assume that posture. The upper part of the chest and the ever restless upper limbs should be protected by a woollen jacket, and no reasonable restraint offered to the patient's inclination to hold the hands above the head. This favourite posture, by acting upon the lower part of the thoracic wall, assists also in diminishing the tension within the abdomen. It is cruel to insist that the hands should be kept beneath the bedclothes. The state of misery in peritonitis is acute enough without being increased by purposeless and rigid formulae. Cold hands do not cause death, but as on exposure they tend to become cold they should be covered up. The wretchedness of restlessness has a natural relief in little movements.

II.—FEEDING.

The old rule of eighty years ago of giving as little food as possible by the mouth cannot be improved upon. The stomach is not in a condition to receive nourishment, and what is taken usually remains unutilised, and is returned unchanged. The practice sometimes met with of laboriously plying the patient with teaspoonfuls of this meat extract or of that, recalls the legend of the Danaïdes, who spent their energies in pouring water into pitchers without bottoms. Two extremes are to be avoided. The first is the rigid, unreasoning, and often needlessly cruel prohibition of food of any kind by the mouth; and the second is the reckless and intemperate use of ice or iced fluids.

Thirst is often a most terrible symptom in peritonitis. It is not always quite relieved—at first at least—by rectal injections. The patient is ready to give his life for a drop of cold water. If he takes it he is sick, but he is much relieved. This little indulgence does not introduce anew the symptom of vomiting; it is there, but it is latent, and the drop of cold water only makes it evident. The patient will not die of vomiting, and simply because a rigid exclusion of all fluid by the mouth does not render the symptom apparent it does not render it non-existing. The man would sooner vomit than endure his thirst. Very often great relief is given by allowing a fairly copious draught of fluid, which is soon rejected, and which—as it were, by washing out the stomach—leaves the patient for awhile infinitely comforted. On the other hand, the perpetual sucking of ice is as bad as the perpetual teaspoonful of useless jelly or of decomposable meat juice. The filling of the stomach with iced water does undoubtedly add to the general depression of the patient, especially when vomiting has been brought into abeyance by morphine.

The right course appears to lie between these two extremes. There should be no rigid formula except this—let the patient take as little food as possible by the mouth. If there be a raging thirst, let him have a little ice—and very little suffices—or a little iced milk and soda water; or if, as is common, the inclination lies towards something warm, let him take a few spoonfuls of hot water or of weak tea made hot, or of beef-tea at a like temperature. It is not the nourishment that is needed (and I imagine that the nourishment in beef-tea is merely an ancient but cherished fiction), but some fluid in the stomach. It is better within reasonable limits to be guided by the patient's own instincts than by a blind formula founded upon a doubtful physiology. This same physiology has added very much to the miseries of death from peritonitis.

As regards actual feeding—in the usual sense—that should be carried out by rectal injections. The injections should be small in amount, should be weak, should be made of some peptonised meat extract or infusion, should be given slowly, and should be of the temperature of the body. An injection of two to two and a-half ounces of peptonised beef-tea with half an ounce of brandy appears to answer well, and may be given every three or four hours. Thirst is better relieved by an injection of half a pint of warm water given alone, than by diluting the nutrient enemata to that extent. I do not think that nutrient suppositories are so well suited for cases of peritonitis as is the ready-made fluid injection. Irritability of the rectum may be to some extent met by

washing it out now and then, and by a weak injection of cocaine. In the more advanced cases, the sphincter begins to relax as the loss of power progresses, and then very usually nothing can be retained. It is undesirable to harass the last hours of a dying man by nutrient enemata, simply because it is the custom.

If there be diarrhoea, or if the bowels be acting freely, then rectal feeding cannot be adopted, but, fortunately, in these cases the vomiting is slight, as a rule, and fluid and a certain amount of nourishment can be taken by the mouth. It is, perhaps, needless to add that in cases, with or without diarrhoea, in which there is no vomiting, all that is given may be given by the mouth. Much complaint is often made by patients with peritonitis of the horrible state of the mouth. The tongue is dry and stiff, and such sense of taste as remains is only capable of appreciating a bitter nastiness. Something can be done to relieve this by keeping the teeth brushed, by washing the mouth out with a 1 in 80 carbolic lotion, or with a mixture of eau de Cologne and water, by actually cleaning the tongue and by keeping it moist with glycerine and water.

III.—OPIUM.

Here again the old practice appears to be the best. Give as little opium as is possible. In the early stages of acute peritonitis, and especially in the perforative forms, and in those depending upon appendix troubles, morphine in the form of a hypodermic is absolutely necessary. In the worst instances it may certainly avert death from shock. Under its influence the patient revives, and the more intense symptoms become greatly modified. Morphine should never become a feature in the routine care of peritonitis. It masks the symptoms, hinders the natural process of cure, and hampers treatment. The indication for it is actual pain, and not mere restlessness and misery. In the really septic forms but very little morphine is called for, and often none at all. Its evil effect in the after-treatment of cases of abdominal section has been amply demonstrated. In quite hopeless cases there can be no objection to its freer employment, but in other instances the administration and the dose of the drug must be sanctioned and measured by the one symptom—pain.

I have noticed that in those who are dying of general peritoneal sepsis, a greater sense of relief usually follows the hypodermic injection of strychnine than attends the use of morphine. The strychnine appears to act as a stimulant would—the patient revives for a while and feels more hopeful under its influence, his moanings cease, his miseries are less unendurable, and for the twentieth time he thinks he may get better.

IV.—APERIENTS.

At the commencement of the century the use of aperients was a necessary element in the routine treatment of peritonitis. By aperient treatment may be understood the obtaining of an action of the bowels by either drugs or enemata. After a certain number of years the practice altered, and the dictum went forth that when any signs of peritonitis were present, aperients were to be absolutely forbidden.

Within the last few years the more ancient method has been revived, but it has been revived with very radical modifications. To Mr. Lawson Tait the profession is indebted for this return to an almost forgotten practice, and, above all, for the employment of that practice with the new element of discrimination. Mr. Tait's measure has been frequently spoken of as "the treatment of peritonitis by aperients," and it has been assumed by some (and probably with disaster) that a purgative is necessary in every case of peritoneal inflammation. Mr. Tait's precise words on this subject are as follows:—"I have never said that the purgative treatment will cure peritonitis, for peritonitis, once it is completely established, is a practically incurable disease, and almost uniformly fatal."¹³ It is on this very point that the centre of the position with regard to this treatment turns.

Aperients can never be adopted in the routine treatment of peritonitis. In the larger proportion of cases this measure is entirely useless, and in the great series of the septic forms it is more or less impracticable. In most of these septic examples enemata of any kind may be administered, and purges of any character may be given, and the probability is

that the bowels will not act at all, and if they do respond it is more than probable that the treatment will not affect the prognosis in the least, and certainly not in the patient's favour. If the aperient could eliminate the fatal poison which is circulating in the patient's system then good may follow, but even the most enthusiastic advocates of purging cannot credit their drugs with this power.

There is no doubt but that there is within the intestine an amount of noxious or poisonous matter which remains harmless so long as the viscus retains its normal condition, but which may lead to septic symptoms if certain changes are induced in the wall of the bowel, or possibly in its contents. This has been especially shown in connection with the potentialities of the colon bacillus, and it is clear that these noxious elements include not only simple chemical substances, but also various micro-organisms and their hurtful products.

Equally evident does it appear to be that the injurious matters within the disordered bowel can, within certain possibly narrow limits, be got rid of by the action of aperients. In acute intestinal strangulation death may follow in a few days. The patient in such cases dies neither of pain, nor of vomiting, nor of the obstruction to his bowels. After his death there may be found no signs of peritonitis, or evidences only of the slightest form of that condition. He dies of general septic intoxication, and the poison is derived from his intestine.

This poison is rendered potent by the abrupt and gross changes which the strangulation has produced in the intestine. Mere retention of the contents does not explain the disastrous results. In examples of chronic obstruction the bowels may not act for six or eight weeks and yet the patient may recover. The subject of a constipation of this degree will, it is true, exhibit some signs of poisoning. He is languid and apathetic, he vomits, the taste in his mouth disgusts him, he has headaches, his breath is rendered intensely offensive by reason of the matter, probably gaseous, which has been absorbed from his intestine, and is to some extent discharged from the blood through the lungs.

Some gross disturbance in the complex mechanism of the bowel wall is needed to render the poisonous contents of the intestine acutely poisonous and to favour its ready introduction into the system. Of the effect of a thorough evacuation of the alimentary canal in such an instance surgical experience can testify. Such a case as the following must have come within the knowledge of every surgeon who has dealt with many cases of intestinal obstruction. Some years ago I was called to see a vigorous man of 45 who had suffered from acute intestinal obstruction for some three days. I opened the distended abdomen, and I recognised that peculiar faintly-stinking peritoneum with which such operations soon make one familiar. Immediately beneath the incision was revealed a single omental band which had caused the trouble. This was divided and the abdomen was closed. The operation lasted a few minutes. Still the man died, and the necropsy revealed no perforation and no gangrene of the bowel, and no abnormal change in the peritoneum save a little stickiness. The patient died, not because his bowels were obstructed, but because that obstruction allowed septic matter to be absorbed from his intestine. His trouble was not outside his bowel but within it. Had I made an opening in the gut and allowed the poison-loaded viscus to relieve itself the result may have been different. Such an operation would have been comparable to the washing out of the stomach after an active poison had been swallowed.

It is a fact that the most successful treatment of acute obstruction of a certain grade is that which provides for a thorough evacuation of the loaded gut. A blindly-executed enterostomy, with an utter ignoring of the cause of the obstruction, has been attended by better results than have operations in which the agent of the obstruction has been discovered, after elaborate search, and has been satisfactorily dealt with. This treatment of acute obstruction by the evacuation of the bowel before all things we owe to Benjamin Travers, the father of intestinal surgery. In cases of strangulation of a certain degree he insisted that the bowels should be cut into and emptied, even after the obstructing band had been removed. He considered that the operation was not complete until this had been done; he urged that safety was

only to be obtained by an evacuation of the gut, and he supported his views by numerous cases and experiments.

Another illustration of these selfsame points is afforded by perityphlitis. In a previous section of these lectures I have shown that those cases of perityphlitis in which there is diarrhoea, or in which the bowels act naturally or under the influence of aperients, are attended with a much lower mortality than are the cases in which constipation is marked. In my own experience I am convinced of the value of the aperient treatment in the earliest stages of these cases, and of the pursuit of the same measure throughout in selected instances. In some cases, however, nothing within reason will bring about an action of the bowels. The subjects of repeated attacks of perityphlitis are aware themselves of the evil effects of constipation, and many of them have learnt that they can ward off an attack, or minimise it, when it comes, by a prompt aperient.

A further illustration of the subject from the same standpoint is afforded by that alarming intestinal condition which is sometimes met with after abdominal operations, and which was at one time spoken of as peritonitis. The exact nature of this condition was, I believe, first recognised by Dr. Malcolm.¹⁴ It has been fully dealt with subsequently by Olshausen¹⁵ and Verchère.¹⁶ The former writer has applied to it the convenient name of "pseudo-ileus." The symptoms are these: On the second or third day after a not necessarily severe abdominal operation the abdomen becomes distended, the patient becomes uncomfortable, and complains of "wind." The distension increases; vomiting sets in. At first only the contents of the stomach are rejected; very soon the matter becomes bilious, and finally there is copious "coffee-grounds" vomiting, and this may present a fæulent odour. The vomiting tends to become worse and worse, and is much more copious than is common in peritonitis. The pulse becomes smaller and feebler, the temperature usually sinks, and exhaustion increases with alarming rapidity. On the fourth or fifth day after the operation the patient may die. At the necropsy the peritoneum may be found to be practically unchanged, or to exhibit so trifling a degree of peritonitis as not to account for the symptoms, nor for the fatal result. Various explanations of this condition have been given. There is no doubt that the nervous disturbance which attends any abdominal operation leads to some degree of intestinal paralysis. This paralysis, attended as it is by vasomotor changes in the bowel wall, is favourable to the absorption of septic matters from the intestine. The paresis may be slight and may disappear spontaneously, or it may subside if the distension of the bowel can be relieved by the introduction of a rectal tube. If it persists it appears to permit of a filtration through the intestinal walls of septic materials, of bacteria or of their products. These latter are readily taken up by the peritoneum, and a septicæmia commences. This is the explanation given by Olshausen, Verchère, and others, but it is not accepted by Dr. Malcolm.

Anyhow, it was pointed out by Mr. Tait, and has been made evident to most surgeons who have followed his teaching, that if an action of the bowels can be obtained at the outset of the symptoms, either by the administration of a purgative or by an enema, the trouble in a large proportion of cases passes away and the patient makes a good recovery. It cannot be said that this good result follows in all cases, and it is evident that the purgative, like the emetic given in acute poisoning, can only bring about an arrest of the symptoms within certain limits.

It only remains to point out that when once general peritonitis has established itself, an aperient is without avail. In those septic cases in which diarrhoea occasionally sets in, this is only too apparent. An example such as the following serves to illustrate this point:

A woman, aged 43, was seized with symptoms of acute abdominal trouble some hours after eating a very heavy meal. She was admitted into the London Hospital on the fourth day after the onset of the attack. She had then the symptoms of peritonitis. A laparotomy was performed, and an enterostomy was carried out without any attempt having been made to discover the cause of the inflammation. The patient died in two days, and before that time the bowel had entirely emptied itself through the artificial opening. The symptoms of peritonitis were in no way influenced, and I imagine that the patient's death was neither hastened nor delayed. The jejunum was found to be gangrenous in two places, as a result of very acute enteritis. There was general peritonitis, but no perforation.

In conclusion, therefore, it must be said that aperients—in

the ordinary sense—are of no avail in established general peritonitis. That in the peritonitis following hernia, or associated with acute intestinal obstruction, the complete evacuation of the bowel is desirable, for reasons which are apart from the peritonitis. In septic peritonitis—in the usual acceptance of that term—aperients are useless, and the same may be said of their employment in true perforative peritonitis.

In a large proportion of examples of perityphlitis, and in the pseudo-ileus which may follow after operation, the prompt evacuation of the bowels is often attended with the very best results.

On both theoretical and clinical grounds the thorough emptying of the intestine before any abdominal section is performed may be regarded as absolutely essential.

V.—BLOOD-LETTING.

This measure of treatment may with advantage be more extensively employed. It is no longer likely to be used in the unreasoning and mechanical fashion of bygone days. In robust forms of localised peritonitis blood-letting is attended with admirable results. In perityphlitis the application of half a dozen leeches often acts with magical effect. In the older accounts of the treatment of peritonitis by bleeding no good appears to have followed in cases in which the inflammation was diffused, except, perhaps, in some examples due to injury. On theoretical grounds this is precisely what would be expected.

VI.—OPERATIVE MEASURES.¹⁷

These are represented by incision and drainage, with or without irrigation. This treatment must be considered as it applies to peritonitis, under two entirely different aspects. In one series of cases there is vigorous well-defined inflammation, the local symptoms are marked, pus is produced, and may be considerable in amount, and the exudation is more or less clearly localised. Examples under this heading are afforded by peritonitis started by mischief in the vermiform appendix, by many forms of peritonitis within the pelvis and in the subphrenic region, and by certain cases of limited inflammation following upon injury or perforation. In the other series of cases the peritonitis is diffused, the constitutional symptoms are more prominent than the local ones, the changes in the serous membrane—so far as evidence of inflammation is concerned—are comparatively slight, and are out of proportion to the general disturbance. This form is illustrated by cases in which there is a general septic intoxication starting from the peritoneum, by peritonitis due to perforation, or following after strangulated hernia or enteritis, by puerperal peritonitis, and by examples of genuine peritonitis following operations upon the abdomen. In the first series of cases surgical interference by incision and drainage ranks with the procedure of evacuating a large abscess. In the second series the cut into the abdomen and the subsequent flushing out or drainage are to be compared with the washing out of the stomach after an active poison has been swallowed. In the one case the body has to be rid of the products of a robust and possibly limited inflammation; in the other case an attempt has to be made to remove from a cavity a poison which has already wrought no little harm. The operation in the latter instance is directed not so much against an inflammatory outbreak as against a progressive poisoning.

The operative treatment of suppurative peritonitis, especially when the effusion is localised, has been remarkably successful. Records of the operation extend back into the eighteenth century, and all that modern surgery can lay claim to is the application of the treatment with greater boldness, with greater frequency, and with infinitely less delay.

The operative treatment of general diffused non-tuberculous peritonitis has, so far, no record to boast of and little progress to chronicle. I am doubtful if a single human life has been saved by surgical interference in a genuine case of peritoneal toxæmia. Surgical treatment has been most discouraging in acute peritonitis following upon gangrenous hernia, upon operation, and upon puerperal infection. It has met with but little better results in cases of perforation, in which the serous inflammation has been well established.

The somewhat imposing lists of cases of success after laparotomy for acute suppurative peritonitis afford sorry matter for congratulation when submitted to a careful scrutiny. The following may be cited as illustrative of this:

Krecke¹⁸ gives a list of 119 cases of generalised purulent peritonitis treated by operation, and attended with only 68 deaths. In 18 instances the cause of the peritonitis was unknown, and in 36 cases it was due to trouble in the appendix, and it is among these 54 examples that the greater number of the successes are to be found. All the cases of peritonitis associated with hernia or with perforation of the stomach died.

Steinthal¹⁹ gives a list of 20 cases of perforative peritonitis treated by operation. There were 10 recoveries, but in no fewer than 7 of these cases the pus was encapsuled, and was apparently dependent upon perityphlitis; at least it is stated that in 11 cases out of the 20 the perforation was in the appendix. Some of the cases are remarkable enough, but they are not examples of that form of generalised peritonitis which is usually associated with perforation.

Kaiser²⁰ has collected 30 cases of operation in perforative peritonitis, with 11 recoveries. In 5 of the examples of cure the locality of the perforation was unknown.

Körte²¹ after pointing out the fallacy of statistics and the fact that the successful cases are probably all reported while the failures are commonly left in obscurity, gives a list of 40 consecutive cases operated upon by Mikulicz, Krönlein, and himself for purulent peritonitis. Out of this number there are 11 recoveries, and these include no fewer than 7 cases of perityphlitis.

Kriege²² gives a case of perforation of the stomach, which was treated successfully by an operation carried out twenty-four hours after the viscus was supposed to have given way, but in this instance there was no peritonitis. He incidentally alludes to 6 other recorded cases, all of which ended in death.

Some very excellent results have attended early operation for injury of the bowel and other abdominal viscera, but these results cannot justly be considered in connection with laparotomy for fully established peritonitis.

As to the actual mode of operating adapted for the different varieties of peritonitis, I would venture to draw attention to the following points. In all cases it is to be assumed that the skin over the operation area is cleansed and prepared in a suitable way, and that the surgeon adopts those measures which students, in their examination papers, are so fond of describing as "strict antiseptic precautions."

In cases of localised purulent peritonitis an incision should be made into the collection by the most direct route. When the pus has escaped, a rubber drainage tube of suitable size and with stiff fenestrated walls should be passed to the bottom of the cavity. A dressing of some absorbent material, such as Tillmann's paper, sal alembroth, or cyanide gauze is then applied. I have seen no advantage attend either the fuller evacuation of the pus by squeezing or the immediate irrigation of the cavity, and I am confident that distinct harm may be done by scraping the wall of the enclosure, by persistent searching for a diseased appendix or other cause of the trouble, and by stuffing the exposed space with a considerable quantity of gauze. At the end of twenty-four or thirty-six hours the irrigation of the cavity may be commenced and continued twice daily, and now and then a little iodoform emulsion may be introduced.

In some examples of perityphlitis a well encapsuled collection of pus is not exposed, but the knife enters into an ill-defined district containing a variable quantity of thin, greenish, and often offensive matter, which appears to saturate the tissues. In such circumstances I have been in the habit of using a drain composed of strips of iodoform gauze, which are carefully introduced into the lowest accessible recesses of the region.

In cases of generalised peritonitis, the procedure adopted must obviously depend upon the cause and degree of the trouble. If the exudation be serous it will suffice if the fluid be evacuated, if the peritoneal cavity be gently dried in its most dependent parts by means of gauze sponges, and if the abdomen be closed without drainage.

When the exudation is sero-purulent or purulent, it is in many cases desirable that the cavity be irrigated. The fluid which appears to be best suited for this purpose is a sterile 0.6 per cent. salt solution made warm. The details of irrigation will be discussed later on. After the washing the depths of the peritoneal cavity are dried, so far as is possible, with sponges; iodoform powder is (except in children) dusted over the portion of the serous membrane most involved, a long, rubber, fenestrated drainage tube may then be introduced, and the abdominal wound closed. Any treatment directed against the cause of the peritonitis will be independent of these measures. In the treatment of the ascitic

forms of tuberculous peritonitis the best results have followed simple incision without either irrigation or drainage. The use of the rubber drainage tube is apt to be followed by an obstinate sinus.

There are cases in which the peritonitis is more plastic in character. The intestines are found to be matted together with greyish lymph, which may be present in considerable quantity. The breaking down of these adhesions causes no little amount of bleeding, and such a step is evidently destructive of a certain desirable process of repair. Still, in order to search for the cause of the peritonitis, assuming such search to be indicated, and to set free an amount of exudation which is imprisoned between the attached coils, this freeing of adhesions must be at a certain, very limited extent carried out. There will probably be a sero-purulent exudation in the belly cavity, and the gentlest movements of the fingers among the recently attached intestines will set free more fluid, which will be probably less opaque. A clump of adherent intestines will often cover and protect a perforation, and the ubiquitous lymph will many times close such an opening with more speed and security than are provided by any system of suturing. As the surgeon, therefore, reaches what appears to be the starting point of the peritonitis, he must proceed with the utmost caution, and be not only prepared, but rather inclined to leave the actual *fons et origo mali* undemonstrated. The main purpose of the operation is to allow a noxious exudation to escape, and, if possible, to free the peritoneum of the cause of its trouble. In the class of case now under discussion, a perforation will be very often the starting point of the peritonitis; the lapse of time and the plastic character of the inflammation afford evidence that the perforation is for the time being closed. If the operator can rid the serous cavity of the effects of the perforation, he may very often leave the breach itself to be dealt with by natural means.

The wisdom of doing no more than is necessary, or as little as is obvious, is well illustrated by these cases. It is a very striking fact that some of the best results in the treatment of perforative peritonitis have been obtained in instances in which the exact site of the perforation was never ascertained. In Kaiser's statistics already alluded to, there were 6 such examples, and of these 5 recovered. In this form of peritonitis a liberal dusting of the serous membrane with iodoform should be carried out (except in cases in children). Drainage is seldom required, and when employed is best provided for by strips of iodoform gauze passed among the intestinal coils to the necessary depth. Irrigation is certainly not suited to this class of case. Gauze mops or sponges in holders form the best means of clearing the peritoneum under the circumstances named.

It only remains to consider what means may be taken during the performance of an abdominal section to prevent the onset of peritonitis, and to discuss the two vexed questions of irrigation and drainage. "The Modern Laparotomy," as Döderlein²³ presumes to call it in a recent elaborate paper, is a procedure which has evidently not yet reached the stage of recognised formulæ, nor attained to the position of a stereotyped process.

A perusal of the numerous writings upon the *technique* of the operation leaves an impression that the opening of the abdomen is still regarded with an almost superstitious awe, and if still approached by many with a fussy and meaningless ceremonial, that elaboration of detail may be carried to a degree which is merely fatuous, but that although surgeons differ greatly in their methods, they differ but little in their results.

An infinitely elaborate *technique* is no substitute for lack of skill in operating, and the power of the human body to resist the effects of injury is not capable of unlimited extension by artificial means.

It is needful in the first place that the operation room should be surgically clean, that the patient should be clean, and that the operator should be clean. The attaining of this end appears to be as satisfactorily accomplished by the charwoman, the laundress, and the nailbrush, as by complex chemical processes. There seems to be no imperative need that the operation chamber should be capable of being washed out in the same manner as the interior of a cup, nor do results show that it should be so constructed as to be con-

vertible into a vacuum or so ventilated as to admit only a stream of sterilised air. The skin over the abdomen can be prepared by a liberal scrubbing with soap and water, followed by washing with ether and the final application of a carbolic compress, which is applied some hours before the time fixed for the laparotomy.

Ligatures and catgut are, I think, best kept in an ethereal solution of corrosive sublimate. They can be dipped into sterilised water just before they are used.

The methods of rendering instruments surgically clean are legion. I adopt the practice of placing them in a 1 in 20 carbolic solution for fifteen minutes previous to the operation. Just before they are used the solution is diluted with sterilised water until it represents 1 in 80 or 1 in 100 in strength. To take an instrument direct from a strong carbolic solution and use it within the abdomen is to bring a caustic and damaging irritant into contact with the peritoneum, inasmuch as some of the solution must drop from the knife or forceps so employed.

Gauze sponges do fairly well for the peritoneum if properly prepared. They are best left to soak for some time in a 1 in 20 carbolic solution, which is very freely diluted with boiled water just before the sponges are passed through the roller. Ordinary sponges in holders are better adapted for the depths of the cavity. As they are not readily cleaned after use they are burnt as soon as they have been once employed. This disposes of many uncertainties.

It is obvious that the less the peritoneum is touched, stretched, rubbed, and handled the better. Now and then it may be desirable to repair, with a continuous suture, any rent made in its surface.

I have tried every method of closing an abdominal wound of which I have had any knowledge. I believe the best plan is to steady and straighten the wound edges with blunt hooks while the needle is being passed, to sew up the peritoneum with a continuous suture of fine silk, and to close the rest of the parietal wound with a single row of silkworm gut sutures which embrace all the soft parts, excepting the serous membrane, and which are passed by means of straight needles.

Any damaged surface of peritoneum should be well dusted with iodoform, and into the ragged cavity left after the removal of an adherent kidney or a sessile tumour, a liberal quantity of the same powder may be introduced. I have reported certain cases which encourage the impression that some security against peritonitis is to be obtained by the free use of iodoform within the abdominal cavity.²⁴ Iodoform should, however, not be used in the case of children as it is very apt in them to produce symptoms of poisoning.

It is needless to say that the peritoneal sac should be left as dry and as clean as possible; that all bleeding should be carefully arrested, and all clots, pus, cyst fluid, and the like should be thoroughly removed. It is possible, however, that these ends may be attained at too great a cost, and that the "toilet of the peritoneum" may become a very uncouth and barbaric process. Within certain limits, I believe it is often less injurious to leave some blood clot in the abdominal cavity than to persist in an obstinate determination to remove it at any sacrifice.

An ounce or so of cyst fluid in the peritoneal sac would, I think, do less harm than an attempt to complete the toilet of the peritoneum as carried out by a mechanically conscientious man. This toilet is often a Brobdingnagian affair, and when strong antiseptics and countless sponges are employed it degenerates into mere violence, and is rather of the nature of an assault. If the infinitely tender character of the peritoneum be held in mind, this toilet—as sometimes practised—is comparable to the removal of a foreign body from the eye by means of a scrubbing brush and plenty of washing soda.

IRRIGATION.

Mere blood is better removed from the peritoneal cavity by sponging than by irrigation. If the operation area be well circumscribed by sponges, if the shoulders be raised so that blood will reach the more dependent tracts, and if a sponge be introduced into the pelvis at an early stage of the procedure, there is little trouble with blood clot. Coagulated blood is certainly very much more easily and certainly removed by means of gauze sponges than by a stream of water.

The same observations apply to what may be termed healthy cyst contents, to fluid from hydatids, to bile, and to matter escaping from the stomach or intestine. With careful plugging and a watchful use of sponges a widespread extravasation is uncommon. If it does take place the gauze can usually reach it. Irrigation would possibly have the effect of spreading the noxious fluid—as, for example, intestinal matters—over a still wider area. It may be said, therefore, that if certain precautions be taken the cleansing of the peritoneal sac may be best and most safely accomplished by dry sponging.

If there be a considerable outpouring of such a material as putrid pus, or if there be a copious escape of gut contents, as from the giving way of a distended bowel above a point of obstruction, then it may be better that the whole peritoneal cavity be irrigated. In such a case the amount of the extravasated fluid and its wide distribution would render its complete removal by sponging difficult.

This irrigation is best conducted by the following means: The fluid used is a sterile 0.6 per cent. salt solution at blood heat. It is introduced at low pressure, but in a wide stream. The irrigating tube is of soft rubber, and may have a diameter of three-quarters of an inch. The tube itself is introduced into the belly cavity. The flow through it can be regulated by a clip. Any form of rigid nozzle is to be most strongly condemned. The solution should flow gently into the abdomen. The peritoneal cavity is to be flooded, and not to be scoured out with a violent stream of water, which hisses and rushes from a vulcanite nozzle as from a miniature firehose. When the belly cavity is quite full of fluid the surgeon's hand, which is already in position, is moved to and fro among the intestines with great gentleness. The coils of bowel are thus rinsed. By a movement of the hand and by pressure here and there the fluid overflows from the wound, and is replaced by the steady stream. As the water which escapes becomes clear the upper end of the operation table is raised, so that the shoulders are much elevated, and then little has to be done but to wash out the most dependent parts, including especially the pelvis, and to allow the upper parts to drain. Finally, what fluid remains in the pelvis is removed with sponges, and a sponge in a holder is retained in the bottom of the pelvis during the introduction of the stitches, and only withdrawn at the last moment.

In the actual process of irrigation it is important that the temperature of the fluid be constant, that the abdomen be never over-distended, and that the stream be not directed against the diaphragm. If these precautions be neglected alarming dyspnoea and even asphyxia may take place.²⁵ If the shoulders be well raised, as already advised, these respiratory complications are less likely to occur. Polaillon has observed 3 cases of cessation of respiration in the human subject during irrigation.

Many surgeons have written of late on the subject of irrigation, and the general bias of these communications is very strongly against irrigation. Fluids of all kinds have been used, such as solutions of carbolic acid, of corrosive sublimate, of boric acid, and of salicylic acid. The two last named are the most in favour. Many operators employ boiled water, and not a few a weak preparation of alcohol. It is evident that whatever fluid is employed, it cannot be used as a germicide, and that all that can be aimed at is a solution which is sterile and non-irritating.

It has been urged that irrigation serves to spread the infective material, which it is required to remove, over a wider area, and that it seriously diminishes the resisting power of the peritoneum. Reichel²⁶ strongly insists upon the latter objection. He found that in artificially produced peritonitis in dogs he was never able to ward off death in any case in which it was to be assumed that the animal, if left alone, would die. He introduced faecal matter into a dog's peritoneum, and, having closed the wound, he reopened it after a while and employed irrigation in some cases and sponging in others. He found neither method entirely successful in cleansing the serous cavity, but was convinced that sponging was the more efficient of the two. Even when from 10 to 15 litres of fluid was used a quantity of infective matter was still found to have been left behind. He irrigated the healthy peritoneum in certain animals with boiled water. All the animals so treated recovered, but some were ill for a

long time, and some had urgent dyspnoea. These simple irrigations produced a blood-stained exudation in the peritoneal sac, and many minute hæmorrhages into the intestinal portion of the membrane.

Lauenstein,²⁷ on the other hand, considers that irrigation is theoretically better than sponging, although he acknowledges that in practice he has not found the procedure attended with good results. He thinks that as much damage may be done to the peritoneum by determined sponging as by the irrigator, and in this he is no doubt right.

Into the peritoneal cavity of three corpses Pölchen introduced some faecal matter fifteen minutes after death. He employed immediate irrigation, and found that the material adherent to the bowel after the operation was sterile. When flushing is employed, so much fluid remains behind that some sponging becomes necessary. Other things being equal, irrigation involves more time than the mopping out of the serous sac. Stuehlen²⁸ is among the comparatively few recent writers who consider that irrigation can efficiently cleanse the peritoneum.

Kinscherf²⁹ has carried out a series of experiments which add an additional feature to this subject. He points out that a considerable quantity of fluid may be absorbed by the blood during irrigation, and that the amount may be such that the absorptive power of the peritoneum may be reduced to *nil*. He repeated Delpet's experiments, and irrigated the abdominal cavity of an animal for ten to twenty minutes with a 6 per cent. solution. He then introduced more sulphate of strychnine than was sufficient to produce tetanus in a control animal of the same weight. No effect followed. Kinscherf used a 1 in 2,000 corrosive sublimate solution after the flushing process, and found that no symptoms of poisoning followed, although toxic phenomena were always produced when irrigation had not been previously carried out.

It is, of course, a matter of question how far experiments such as these can be used as arguments *ad hominem*, but of the unsatisfactory results which have followed upon the indiscriminate use of irrigation after operations in man there can be no doubt. In not a few instances it would certainly appear that irrigation has hastened death.

DRAINAGE.

It will be allowed by most that drainage is necessary, when either an actually noxious material is left in the peritoneal cavity, or when it is assumed that an extensive effusion will follow upon the laparotomy. Considerable differences of opinion must exist as to what constitutes, either in substance or in amount, a noxious material, and also to what extent a possible effusion is to be met by drainage. There seems little to commend the employment of a glass drainage tube passed into the fundus of Douglas's pouch. I have ceased to use this appliance, and it would not appear that it is used with any frequency by the majority of those who are much concerned in abdominal operations.

A stout rubber drainage tube of large size and well fenestrated, passed into the midst of the area which is the most disturbed, appears in most cases to answer all reasonable purposes. It is not suited to tuberculous cases, and has in many instances been followed by an obstinate sinus. In any case the sooner the tube can be removed the better. It must be assumed that the surgeon has no objection after the operation to frequent, and perhaps extensive, changes in the patient's position, for the purpose of assisting the process of drainage. I have myself seen no harm arise from a liberal fulfilment of this object. In certain instances, some of which I have already indicated, a gauze drain appears to be better adapted for the case than a rubber one. This drain is simply composed of a long strand of iodoform gauze about an inch and a-half wide and some five to six layers thick. It appears to have been first advocated by Bardenheuer. In a case of purulent peritonitis, Jalaguier³⁰ has passed these strands of gauze in all directions among the intestinal coils from the diaphragm to the pelvis with good result. A like proceeding in like cases is advocated by Steinthal.³¹ The great objections to the iodoform drains are these. They may induce symptoms of poisoning if very extensively employed; they are most difficult to remove unless there be a free discharge, and their use is apt to be followed by ventral hernia. Iodo-

form tampons used to close a breach in the peritoneum which cannot be closed by sutures involve much distress in their removal, and, if left in for a few days, may become quite covered in with lymph. If retained long enough to ensure a complete occlusion of the peritoneal cavity their removal is not so difficult, but a hernia is almost inevitable. The so-called Mikulicz drain is an open bag of iodoform gauze, which is stuffed with strips of the same material. It is used when an actual cavity has to be drained, and the size of the tampon is often alarming. The bag is slowly evacuated, piece by piece, after the first forty-eight hours, and by the fifth or sixth day it is empty, and the gauze sheet itself is then removed. The cases must be few which call for the employment of this formidable tampon.

Some surgeons, either to supplement or to replace drainage, allow the wound to gape, or support it merely by a few quite loose sutures.³² This measure has been especially advocated in the treatment of perforative or purulent peritonitis.

In conclusion, it only remains to be said that the surgical treatment of peritonitis has not yet reached a position which is either satisfactory or secure. There has been lack of boldness in the measures used, and little sense of discouragement at the results obtained. Surgical enterprise has been directed against effects and against damage done rather than against causes and the beginnings of evil. The surgeon holds the same position in regard to peritonitis which was held some thirty years ago in regard to wounds and more accessible forms of inflammation. At that time he dealt only with the consequences of pathological wrong-doing, just as now he concerns himself with the prevention of troubles which he has learnt to control. Peritonitis will be more successfully treated when measures can be directed against the sowing of the wind rather than, as now, against the curbing of the whirlwind.

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FEES FOR GRADUATION IN MEDICINE IN FRANCE.—By decree dated February 14th, 1894, the following fees will be payable by all candidates for the M.D. degree in a French Medical Faculty after November 1st, 1895:—Sixteen "inscriptions" at 32.50 francs, including library subscriptions, 520 francs. Practical classes, payable quarterly for four years, 160 francs: first year, 60 francs; second, 40; third, 40; fourth, 20. Seven examinations at 30 francs, 210 francs. Seven certificates of having passed these examinations at 25 francs, 175 francs; thesis, 100 francs; certificate for thesis, 40 francs; diploma, 100 francs. The total amount payable for the degree is, therefore, 1,305 francs (a little more than £52).

ALCOHOL IN ENTERIC FEVER.—A paper was read by Sir B. W. Richardson, at a recent meeting of the British Medical Temperance Association, on "Enteric Fever," in the course of which it was stated that the actual mortality among patients treated for this disease at the Temperance Hospital had been 14.5 per cent., as against 15.2 per cent., the latter being the average percentage in other hospitals generally. Much was also said in praise of the cold bath treatment. Dr. Bond said that in 380 typhoid cases at the Southern City Hospital, Liverpool, the percentage of deaths had been 8.68; 71 had received alcohol. The cases extended over three years, and the amount of alcohol given had been lessened during the two succeeding years, with a correspondent lower proportion of deaths. Drs. Hingston Fox, Robert Pringle, Norman Kerr, J. J. Ridge, Drysdale, Shuter (of Melbourne), and Paramore took part in the discussion.