THE LETTSOMIAN LECTURES ON PERITONITIS.

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LECTURE I.—THE NATURE OF PERITONITIS.

I HAVE ventured to select peritonitis as the subject of these lectures not only on account of the fact that the diseased conditions known by that name still occupy a terrible prominence among the causes of death, but because the present time appears to be peculiarly convenient for reviewing the clinical and pathological aspects of this fatal trouble, and for criticising opinions which the custom of years has endured with a spurious appearance of accuracy.

By peritonitis is understood an inflammation of the peritoneum. From the limited standpoint of morbid anatomy no exception can be taken to this definition, but when it is assumed that the various clinical phenomena which are classed together under the title of "peritonitis" are due, either solely or in the main, to an inflammation of the great serous membrane, then the definition becomes to some extent misleading. It may almost be said that peritonitis, clinically as well as pathologically, has comparatively little to do with inflammation of the peritoneum, and it would be erroneous to state that the majority of those who die of what is called peritonitis die of a peritoneal inflammation. In order that this very fundamental matter may be fully discussed, it is necessary that two questions should be considered. The first concerns itself with the general nature of inflammation, and the second with the relation peritonitis bears to that process.

I.—THE PURPOSE OF INFLAMMATION.

If one may judge from the terms and expressions which are in common use respecting inflammation, and if deductions may be drawn from those ready criticisms of the process which are uttered without fear of scientific cavillings, then inflammation is still the dread thing it was many centuries ago, when phlegmon was a ruthless fetish, and when the antiphlogistic regimen was the only means of propitiation. Inflammation is still referred to as a calamity, as a thing that is violent, as an utter evil, and as an ill wind that can blow no other than ill. It is spoken of as "breaking out," and made comparable with a riot which lays waste a peaceful city. It is often said that the patient "did well until inflammation set in," or that "his progress towards recovery was cut short by a fatal attack of inflammation." The treatment which should be directed against this evil is commonly assumed to be of the same heroic type as are the drastic measures which may be taken to arrest the progress of fire and pestilence. Inflammation was represented in the literature of the past as the great enemy of mankind, and even in the popular science of the present it retains no little of its satanic disposition.

This view of the inflammatory process needs to be amended, and a very brief survey of some examples of the process should quite justify such amendment. A man, let it be supposed, receives a lacerated wound of the hand in dissecting the body of a patient who has died of puerperal fever. He becomes thereby inoculated at the wounded point with what is practically a culture of pus-producing cocci. Now, as the human body is an excellent medium for the cultivation of bacteria, the micro-organisms begin forthwith to settle down and multiply. But here steps in the process of inflammation. Under its ægis the cells of the body rise in their millions against the invaders, and there takes place at the point of the outbreak a battle which—if the account of

Metchnikoff and others is to be accepted—is without a parallel in the very deadliest warfare imagined by man.

It is by the inflammatory process that the poison is destroyed, and the growth of the parasite is arrested. But for inflammation a man who is accidentally inoculated with a septic micro-organism becomes at once little more than a test tube, prepared for the favourable development and culture of the particular coccus or bacterium. In malignant pustule can be well seen the desperate struggle which takes place in the tissues between the invading bacillus and the aroused and active cells of the body. This conflict is a representation of the inflammatory process, and the beneficent purpose of the change is splendidly obvious. But for this inflammation, which has been so much condemned, a human being may be regarded as an organism not far raised above the level of a peculiarly shaped mass of intelligent agar-agar.

In a case of tuberculous phthisis it is generally assumed that a destructive inflammation of the lung is the chief cause leading to the patient's death. It is not the inflammation which is to blame, but the bacillus which has caused it. How long it would take for the non-resisting lung to become wholly occupied by this particular bacterium it is impossible to say, but it is safe to assert that the inflammation of the lung prolongs the infected man's life, and that his prospects of improvement and recovery depend almost wholly upon it. How many lives and limbs have been saved for a reasonable span by that process in a joint called tuberculous disease—a process which, after many centuries of unjust ignominy, is now servilely imitated by the surgeon in his operation of arthrorectomy! In the familiar "white swelling" is represented the often successful attempt of the organism to rid itself of the tubercle bacillus by means of the inflammatory process. In this, as in other invasions, the enemy is not repelled without loss, but it is the loss of a part as against the loss of the whole.

The philanthropic busybody who, after contemplating the death roll ascribed to inflammations of the lung and brain and kidney, could succeed in ridding the earth of the process of inflammation, would see a result which hardly a pessimist could regard as kindly. It may be assumed that within a month or so of the disappearance of inflammation from the business of the body the human race would become extinct.

Inflammation is distinctly not a malignant energy working only for evil; it is a process with a purpose, and that a beneficent one. Its object is protective, and its end is shown by the freeing of the body of noxious organisms which lead to death, and upon which may well be bestowed the anathemas lavished on what is, in its primary purpose, a curative process.

That inflammation may be excessive in individual cases, that it may be attended by certain disasters, and that it may fail to some degree in its purpose, are evident facts. It is also clear that the process of inflammation may be assisted and modified by treatment, especially if it be in the direction of removing from the tissues those irritants which have not only caused but have maintained the inflamed state. Treatment having for its object the abrupt arrest of inflammation and the vigorous stamping out of its manifestations has not been attended with conspicuous success.

What has been said of inflammation in general applies equally to inflammation within the great serous cavity of the abdomen. Peritoneal inflammation is not a purposeless calamity; that which has caused it is the thing which is wholly ill. It is by the process of inflammation that the advance of certain deadly irritants, which have gained access to the cavity, can be arrested. The purpose of peritonitis is towards the saving of life, and not towards the destruction of it. What is seen within the abdomen at the necropsy on a case of peritonitis represents the results of an attempt on the part of the organism to avert a too potent cause of death. It does not represent, as is too commonly assumed, the reckless and fanatical destruction wrought by a wholly evil-tending process.

II.—THE RELATION OF PERITONITIS TO THE INFLAMMATORY PROCESS.

In the larger proportion of examples of fatal peritonitis the leading symptoms are those of poisoning and not of inflammation and death is due rather to toxæmia than to

inflammation of the serous membrane. This view of the subject was advanced by Wegner,¹ nearly twenty years ago.

There is about the patient who is dying of peritonitis every suggestion of a poisoned man. He lies back in bed prostrate, with gaunt cheeks and sunken eyes. There is a look of unceasing anxiousness in his face, and a sense of hopeless uneasiness in his movements. The hands, which wander with pathetic restlessness over the bedclothes, are cold and damp. The tongue is that of a man who is dying of thirst. There is constant vomiting. The breathing is laboured, and accompanied by faint sighs and groans, and the countenance is ashen and livid. Such a picture makes a reality of the metaphor of "the shadow of death." So far as the aspect of the patient goes, he might be dying from snake bite or from the poison of cholera, while there is little to suggest an inflammation so intense as to be ending fatally in a few distressful days.

When the patient dies and the abdomen is opened, the amount of inflammation discovered is out of all proportion to the phenomena which preceded death. In one case there may be merely some injection of the peritoneum with loss of its polished surface, and in its place a general stickiness and a few frail and insignificant adhesions. In another there may be an ounce or so of thin greenish pus around the cæcum, an exudation looking ill-conditioned enough to the surgical eye, but still a mere scanty mixture of pus and turbid fluid, and not the kind of formidable effusion which would be expected in a case of death from inflammation. As a matter of fact, the contrast between the phenomena before death and the degree of inflammation found afterwards may be still more marked, as the following case will show:

A woman of 62 came into the London Hospital with a femoral hernia which had been strangulated four days. Herniotomy was at once performed; some omentum was removed, and the purple-coloured gut was reduced. For the rest of the day and during the day after the patient vomited with little cessation, her abdomen became swollen and painful, her pulse failed, and her strength declined. She passed into the condition already described, and on the morning of the third day she died. Throughout the temperature had never risen as high as 99°. The necropsy revealed an operation without a flaw, and an abdominal cavity showing no morbid change but a faint injection and a faint dulling of the lower districts of the peritoneum.

Such a case may be rightly described, in accordance with ancient usage, as one of death from peritonitis, but it can hardly be spoken of as death from inflammation. A further aspect of the case may be illustrated by sundry experiments upon animals.

If a certain dose of a particular septic matter be introduced into the peritoneal cavity of an animal, peritonitis follows, of which the animal dies in three or four days, and there are found at the necropsy the characteristic changes in the serous membrane. If a smaller dose of the same poison be used, symptoms of peritonitis follow, from which the animal may recover with or without the previous development of an encysted intra-abdominal abscess. If a larger dose be employed, the animal may die within twenty-four or thirty hours with symptoms which are at least suggestive of peritonitis, and yet exhibit after death a peritoneum either devoid of any evidences of inflammation or displaying the most insignificant changes.

A similar order of circumstances would appear to hold good in the human subject. In some of the most rapid cases of death after such a lesion as is known to be capable of causing peritonitis, no inflammatory changes are found within the abdomen. The patient is said to have died of shock, and the cause of that shock would appear in the majority of instances to be due to the profound nerve irritation caused by the sudden spreading of noxious micro-organisms or their products over a wide and sensitive surface. In the next series of cases the patient lives for three or four days, he exhibits the features of acute peritonitis, and after death the serous membrane is found to show but the early manifestations of inflammation. In other instances recovery follows after a more or less desperate illness, and this may be effected with or without the development of encysted suppuration.

In the human subject, as in the laboratory experiments, it must be remembered that where the question of sepsis is concerned, not only must the dose be considered, but also the power of resistance of the individual.

In further support of the statement that in the larger pro-

portion of examples of fatal peritonitis the leading symptoms are those of poisoning and not of inflammation, and that death is due rather to toxæmia than to inflammation of the serous membrane, the following points may be adduced.

It is noteworthy that the cases in which suppuration is the most pronounced are among the most favourable examples of peritonitis, and that, on the other hand, the most acute and unfavourable cases are found with those which show the least inflammatory changes.

I shall have to refer later on to a collection of 100 cases of peritonitis obtained from the records of the London Hospital. Out of this number 70 died. If there be excluded from these fatal cases 13 in which the cause of the peritonitis was either never discovered or was due to cancer or tuberculosis, there remain 57 examples of death. In only 15 of these was the exudation found to be purulent; in 11 it was described as sero-purulent; in the remaining 31 examples there was no suggestion of pus. This is hardly what would be expected in a disease the leading phenomena of which are inflammatory.

In not a few instances of puerperal peritonitis the cases, if regarded pathologically, are merely examples of septicæmia in the most ordinary sense. In addition to the usual constitutional signs of that condition, there are certain local symptoms which indicate a disturbance within the peritoneum.

For example, a woman, aged 31, developed some three weeks after her confinement the signs of peritonitis. She died in four days. During that time she continued to vomit, although not severely, and in those four days she had three well-marked rigors, and her temperature ranged from 100° to 105°. So apparent was it that there was some peritoneal effusion that an exploratory puncture of the abdomen was made on the day before death, but without result. The necropsy revealed some localised non-suppurative peritonitis around the uterus, which was fixed. The general peritoneum was quite sound. There was commencing pleurisy of the left side.

Then, again, the surgical treatment of acute diffused peritonitis as a purely inflammatory affection has not been very successful, and has, indeed, been comparatively unsuccessful. This treatment consists of incision and the evacuation of the effusion. It answers admirably in suppurative inflammation of the pleura, and in cases of localised purulent peritonitis, as met with in the pelvis and about the cæcum, and in the tuberculous variety, but in the form of peritonitis now under consideration it is comparatively useless.

It may be also incidentally mentioned that the mortality attending the operation for strangulated hernia does not appear—except in connection with umbilical hernia—to have been greatly improved since the introduction of aseptic measures in surgery. These measures, if complete, are assumed to reduce the risks of inflammation in an operation like herniotomy to a minimum. But even in cases in which neither gangrene nor perforation of the gut occurs, it is evident that there is something besides mere inflammation which is leading to death. It must not be assumed in a contrary direction that inflammatory phenomena are wholly subordinate in peritonitis. In many instances, such as those consequent upon troubles in the pelvis or in the vermiform appendix, the signs of inflammation are paramount. There may be an initial rigor, the fever is high, the pain and tenderness are intense, and the production of aggressive pus is often early and vigorous. Moreover, in tuberculous peritonitis the leading symptoms more usually belong to the category of chronic inflammation, and the patient not infrequently dies of suppuration and its consequences. One cannot avoid repeating that these cases represent the more favourable aspects of peritonitis, and that they respond well to those general operative measures which are applicable to inflammation.

In concluding this part of the subject, it is only fair to say that other views of the mode of death in peritonitis are held by many competent authorities, and in illustration of this I cannot do better than refer to the very thoughtful and original monograph on this subject by Dr. John Malcolm,² who contends that to nervous disturbances must be referred many of the conditions which have just been discussed.

THE PECULIARITIES OF THE PERITONEUM.

It is obvious that there are phenomena attending a lesion of the peritoneum which a reference to like disturbances in other serous membranes cannot explain.

Both pleuræ may be violently inflamed, and that inflammation may run on to suppuration, and yet the condition has not the gravity of a case of peritonitis in which the evidence of inflammation may be slight, and in which the exudation, if collected, may only amount to a few ounces of sero-purulent fluid. Even when the necessary allowance is made for the greatly different extent of surface in the two cavities, an explanation of the differences in the relative prospects of death is not forthcoming. It will be said that the gravity of the two cases depends, not upon a damage to the serous membranes, but upon a resulting disturbance of function in the viscera they cover. From this point of view peritonitis may be considered to be more aptly compared with inflammation of the meninges of the brain. But even this comparison is not entirely satisfactory. That death must follow a gross interference with the functions of the brain is obvious, but it is not so evident that those who die of peritonitis die because the functions of the abdominal viscera are gravely disturbed. We do not encounter in peritonitis such fatal functional disturbances as suppression of bile or suppression of urine. In a case of acute peritonitis ending in death in four days, we have for that time the following evidences of abdominal disorder. There is constant pain and frequent vomiting, and absolute constipation, and the ingestion of no food. But a patient may be in pain for four days, and may be starved for four days, and may vomit for four days, and have no action of the bowels for four days, and yet live. So far as functional disturbance of the viscera within the belly is concerned, it is safe to say that in many cases of severe lead poisoning which end in recovery, the visceral disorders are more considerable than they are in some examples of peritonitis which end fatally in a few days.

Then, again, septic matter often finds its way into the pleural cavity. It is true that serious symptoms may follow, but they are by no means of necessity fatal, and are certainly not to be compared in gravity and deadliness with the results of introducing a part of the same septic matter into the peritoneal cavity.

The following points may be noted with regard to the peritoneum:—

1. Its surface is very considerable, and is probably, as Wegner³ states, as great as that represented by the whole integument of the body.

2. The membrane possesses remarkable powers of absorption, as shown by the manner in which milk, blood, pepsines, etc., are taken up. It is said to be capable of absorbing an amount equal to from 3 to 8 per cent. of the body weight. It is noticed that septic intoxication occurs more quickly in peritoneal infection than in any other. Dirt, pus, fecal matter are more dangerous to life when introduced into the peritoneal sac than when brought into contact with any other like cavity.

3. The peritoneum offers a limited resistance to septic organisms and their products. Experiments upon animals and clinical experience in man show that it can safely dispose of a certain quantity of septic germs. The precise process by which this is effected is a matter of some doubt. There is evidence to show that the resistance of the peritoneum varies within wide limits, and is affected by age, and by such enfeebling disorders as chronic liver or kidney disease. The peritoneum of the rabbit appears to be remarkably sensitive to sepsis, whereas that of the dog has comparatively high powers of resistance. The intestinal mucous membrane affords an infinitely less sensitive medium for septic infection than does the serous covering of the bowel.

4. No tissue in the body provides more favourable conditions for healing than does the peritoneum.

5. The peritoneum does not show the same degree of vulnerability in all parts, nor are all portions of it alike in the manner in which certain lesions are responded to. The part which is apparently most sensitive to infection, and which is most prone to rapidly spreading and diffuse inflammation, is that which covers the small intestine.

The parietal peritoneum has certainly not so high a degree of susceptibility, and is not so apt to assume the diffuse and low form of inflammation. The morbid changes in peritonitis are more marked and more advanced on the visceral layers and omentum than upon the parietal part of the mem-

brane, and this circumstance is not always to be accounted for by the point of origin of the trouble.

Terillon⁴ showed that the effect of irritation of the peritoneum is comparatively feeble over the parietal layer or over the liver, while it is violent and intense when the membrane covering the intestines is involved. Localised forms of peritonitis and encysted exudations are comparatively uncommon in the large area occupied by the small intestine.

Localised peritonitis is met with in those regions which are more or less unoccupied by the coils of the lesser bowel—namely, in the subphrenic district between the dome of the diaphragm above and the transverse colon below, in the region of the cæcum, and especially in the outer side of that region, and lastly in the pelvis. If a list be drawn up of cases of peritonitis which have either been recovered from spontaneously or have been relieved by operation, the great majority will be in one or other of these three districts. It is certain that localised purulent collections are uncommon except in these situations. It is remarkable, moreover, what extensive progress peritoneal inflammation may make in the region of the liver or within the pelvis without inducing very alarming symptoms, and it is interesting also to note how wholesome is the type of the inflammation in many cases, and how substantial are the adhesions produced. Of the localised troubles in the cæcal region, the same can be said only in a modified degree.

The fatality of injuries of the intestine is well known, and the attendant peritonitis spreads like fire. Lesions of the liver and of the bile passages are, on the other hand, often followed by a peritonitis which is slow and moderate, and which may end in recovery.

In making these comparisons it must not be forgotten that in the bowel lesion there will be greater opportunities for septic infection than in the case of a limited injury to the biliary passages, although in many instances of death from wound of the gut there has been no appreciable extravasation of its contents.

Mikulicz⁵ speaks of the transverse colon as if it were a barrier to prevent the spread of peritonitis downwards, and suggests that the comparatively simple character of pelvic peritonitis may be due to the dependent position of the pelvic basin.

6. The peritoneum appears to be possessed of great sensibility—a matter of moment in the production of shock. This sensibility is evidently peculiar and is not quite comparable to that possessed by the skin. Certainly the peritoneum does not feel pain as does the skin. The twisting of a hernial sac and the securing of it with a tight ligature are seldom followed by much distress, and yet the same process carried out on integument of equal extent would assuredly be attended by considerable nerve disturbance. The pain which may accompany the injecting of a large hydrocele with iodine is noteworthy.

The handling of perfectly normal peritoneum is attended with more or less distress in conscious patients. This is illustrated in iliac colotomy performed without anaesthesia, in the reduction of prolapsed coils of intestine covered with unaltered peritoneum, and especially in the removal of gauze-tampons.

I have several times had occasion—especially in operations upon the liver—to place a tampon of iodoform gauze upon normal peritoneum, and the removal of this within twenty-four hours is intensely painful. On one occasion a portion of unaltered omentum escaped with the plug, and the replacement of that tissue caused great distress.

When the surface of the serous membrane has become inflamed and covered with lymph, the ordinary sensibility appears to be dulled or lost. This is noticed in the decrease of pain and tenderness, which is not uncommon as a plastic peritonitis advances, and also by the fact that in iliac colotomy or gastrotomy carried out in two stages, the cutting of the gut or of the stomach when once it has become covered with lymph, is more or less entirely painless.

The irritant which of all others appears to affect the peritoneum the most acutely is that represented by the invasion of the surface by certain bacteria or by their products.

The disproportion between the intensity of the pain and

the comparatively small area of infection is often to be well seen in cases of disease of the vermiform appendix.

7. One matter of great interest, although of some obscurity, concerns the condition of pressure within the abdominal area, and the effects which follow upon the disturbance of it.

It has been many times pointed out that there is no cavity of the abdomen, and that the term, the sac of the peritoneum, is a misnomer. "Every practical anatomist," wrote Benjamin Travers nearly a century ago, "has a familiar illustration of the non-existence of an abdominal cavity in the operation of laying open the abdomen."⁶

In performing laparotomy, the surgeon is constantly reminded that he is cutting into a vacuum and is exposing what is merely a potential cavity. This appears to be more noticeable when the operation is quickly done. I have the impression that when the serous membrane is fully exposed and yet undivided, air may pass through it into the potential space. Some invisible damage may have been wrought by the forceps in some of the more striking instances. Sometimes, especially in a child, a loop of gut may be seen through the peritoneum to be lying in the very closest contact with it. A minute prick is made, and the gut seems to fall away from the membrane and a cavity is revealed.

One would imagine that the disturbance of pressure relations of this kind could not be without effect upon the sensitive tissues and thin-walled blood vessels within the abdominal parietes. The effect of a mere incision into the abdomen is often entirely remarkable. In not a few cases of tuberculous peritonitis a simple laparotomy has been performed, the fluid within the abdomen has been allowed to escape, and the wound has been hastily closed. Yet to the surprise of the operator this elementary proceeding has been followed by complete cure.⁷ What explanation is there to give?

The examples in which complete and quite unexpected relief of abdominal troubles has followed the mere opening of the peritoneal space are numerous. Many remarkable instances have been collected by Professor William White, of Philadelphia, in an interesting paper on the curative effect of operations *per se*.⁸ If all those cases of cure by simple incision be excluded in which a neurosis may have been the foundation of the trouble, there still remain many instances in which the assumption is very strong that considerable physical changes within the abdomen must attend the mere opening of the cavity. Two such instances are afforded by the following cases.

A middle-aged man had all the symptoms of stricture of the pylorus, and was suffering considerable distress. There was some doubt as to the cause of the stenosis. I opened the abdomen, discovered a malignant growth of the stomach, and closed the wound immediately. The parts were in no way disturbed. The patient at once improved, the vomiting ceased, and the dilatation of the stomach diminished. The improvement was maintained for no less a period than six weeks, and before the completion of that time the patient had returned to his easy duties as a gate porter. In due course all the symptoms reappeared, and the case followed the ordinary course of cancer of the pylorus.

The second case was one of suppurative pyelophlebitis, and represents, so far as I can ascertain, the only instance in this grave condition has been treated by operation. The case was under the care of Dr. Frederick Parsons, of Wimbledon, to whom I am indebted for permission to publish this brief preliminary account. The patient was a young lady of 15, who was attacked on September 17th, 1892, with typhilitis. There was a previous history of constipation and of indiscretions in diet. The symptoms were severe, and in spite of prompt treatment by rest, opium, hot fomentations, and enemata, continued to pursue an acute course. On September 21st the patient had a severe rigor. From this date until October 17th she went from bad to worse. Her temperature ranged from 97.6° to 105°. She had a very severe rigor almost every day, but not with any definite regularity. The abdomen remained painful, tender and distended; the vomiting was distressing, the wasting was rapid, and delirium supervened. On September 30th, pain was first experienced in the back on the right side and just below the last rib. Later on, tenderness was noticed over the liver, and that organ became considerably enlarged. There was at no time jaundice or ascites.

The case had certain points of resemblance to malarial fever, and the account of suppurative pyelophlebitis given with much detail in Pepper's *System of Practical Medicine* may have been founded upon this individual case.⁹ The patient was seen by Sir William Broadbent, and it was advised that an exploratory incision should be made over the liver. This I carried out on October 17th. The following conditions were revealed. There was no peritonitis; there were a few adhesions about the cæcum; the appendix was normal. The gall bladder contained about half an ounce of bile. The liver was greatly and evenly enlarged, and was as soft as a lung. It was dotted all over, so far as its surface could be exposed, with minute yellow specks which were of the size of a hole made with an ordinary pin. These specks could be seen but not felt. On actual measurement three were counted in one square inch. After having made the inspection I closed the abdomen. From this day forth

the child made an uninterrupted recovery; the rigors were never repeated; the vomiting ceased, and the temperature gradually sank to normal. She is now in perfect health. The case shows that typhilitis does not always depend upon mischief in the appendix, but that it may be due, as was apparently the cause in this instance, to a stercoral ulcer in the cæcum. Dr. Bartholow, the writer in Pepper's *System of Medicine*, states that "the most frequently occurring cause of pyelophlebitis is ulceration and suppuration of some part of the intestinal tube, and hence the most common result is multiple abscess of the liver." Another sentence from the same monograph may be added. "The termination is death, doubtless invariably."

I cannot help thinking that an explanation of this different result will be forthcoming when something more is known of the pressure conditions within the abdomen.

There are certain other points in connection with intra-peritoneal pressure which remain to be mentioned. In the first place, gravity does not appear to follow the usual lines within the abdomen. One would expect that any effusion which is free within the cavity of the belly would find its way into the pelvis as the most dependent part, and that this would take place even in patients who are lying in bed. It is quite obvious that adhesions must greatly influence this matter. At the same time, the great frequency with which this action of gravity appears to be inoperative, or at least imperfect, is so marked as to call for some explanation. In the second place, the frequency with which escape of fæces fails to take place in spontaneous perforation of the intestine and in punctured wounds of that viscus is somewhat remarkable. Travers¹⁰ lays especial stress upon this, and gives several illustrative cases. He is of opinion that the explanation is to be found in the state of pressure within the abdomen.

Ziegler¹¹ states that in fifteen cases of laparotomy for wound of the intestine, fæcal extravasation was found to have taken place in six instances only. He also considers that this is to be accounted for by pressure, and alludes to the observation of Klemm,¹² who asserts that the idea that the wound in the bowel is blocked up by prolapsed mucous membrane is fallacious.

8. The last point concerns the possibility of the peritoneum acquiring some degree of immunity from septic infection. It has been shown by Reichel¹³ and others that in dogs an immunity from peritoneal infection from pyogenic cocci can be produced artificially. A small dose of septic material is introduced into the abdominal cavity, and after the animal has recovered from the disturbance produced a large dose is injected. This process is repeated at intervals with increasing amounts of the poison, until at last no symptoms are induced by an amount which, in a control experiment, would cause death within twenty-four to thirty-six hours.

A not unlike invulnerability appears to be possible in the human subject. Other things being equal, an operation carried out within the abdomen of a person who has had chronic peritonitis, or who has exhibited repeated subacute attacks, and whose peritoneum presents substantial adhesions, is likely to be attended with better results than when the peritoneum is found to be wholly undisturbed. In the operation for removal of the vermiform appendix in cases of relapsing typhilitis, the little disturbance which follows extensive procedures occupying as long as one hour and a-half can, I think, be explained only by an immunity acquired by the peritoneum after repeated attacks of inflammation. Moreover, in advanced cases the disproportion which is often noted between the constitutional disturbance and the local condition discovered at the operation appears to be capable only of the same explanation.

I have reported¹⁴ the case of a woman with a fæcal fistula, due to the destructive suppuration of a dermoid cyst of the ovary. I opened the abdomen for the purpose of closing the fistula. The tract led down to a hole in the sigmoid flexure, which was firmly fixed in the left iliac fossa. As the bowel could not be brought to the surface, and as the opening could not be sutured *in situ*, there was nothing to be done but to leave it and to pack the area between the hole in the bowel and the parietal wound with iodoform gauze. Very extensive adhesions existed, and for some twelve months previously there had been a smouldering peritonitis. The patient did well, and the good result was probably to no small extent due to the immunity the peritoneum had acquired during the twelve months of inflammatory turmoil.

In looking over the records of laparotomy performed for perforations in the stomach or bowel it is impossible not to

be struck with the fact that in many of the successful cases there had been long antecedent visceral or peritoneal trouble.¹⁵

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TWO CASES OF SUBPHRENIC PYO-PNEUMOTHORAX,

WITH REMARKS UPON THE RELATION OF THAT CONDITION TO GENERAL PERITONITIS WHEN CAUSED BY PERFORATING GASTRIC ULCER.

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THE name "pyo-pneumothorax subphrenicus" given by Leyden to circumscribed collections of gas and pus in the peritoneal cavity immediately beneath the diaphragm is open to objection on account of its inaccurate though pictorial character, and, philologically, as regards the adjective. However, the best name is that which indicates clearly the situation of the pus and its association with gas, and Leyden's term satisfies these requirements more nearly than any hitherto proposed, and, besides, is suggestive of complications truly thoracic. To call such peritoneal collections of pus abscesses is to confuse them with abscesses as ordinarily understood, such as those in the retroperitoneal tissue, which may be equally subphrenic. It is, perhaps, better to describe all collections of pus in a previously existing cavity as empyemata, but when their essential characteristic is association with gas, the term empyema is clearly insufficient.

The causes of subphrenic pyo-pneumothorax are perforations from various lesions of air-containing viscera—stomach, duodenum, or other parts of the intestine—but by far the most frequently perforations of simple gastric or duodenal ulcers. In the case of the stomach, the gas and pus collect generally beneath the left wing of the diaphragm, limited on the right by the falciform ligament. In the case of the duodenum the result is a similar collection, generally to the right of the falciform ligament.

Of the various causes, perforation of the stomach is so much more frequent than the others, that in dealing with the records of but one hospital, I thought it best to confine my analysis to perforation of this viscus and of the duodenum, the latter being included because the majority of simple duodenal ulcers are similar pathologically to those of the stomach, and, whether perforated or not, are not easily distinguished clinically.

The first of the two cases related was an exquisite example of subphrenic pyo-pneumothorax. Its origin, which happily remains uncertain, was probably an unusual one; but perhaps the chief claim of the case to be recorded is that its treatment was completely successful, certainly a rare termination to such a condition.

The second case was less remarkable, but was a characteristic example of its kind, with a characteristic complication to which the death of the patient was due. This case is included in the table given below.

CASE I.—B. E., aged 42, a bricklayer at a silver refinery, was admitted into St. George's Hospital on May 11th, 1893, and came under the care of Dr. Owen. He stated that he had been liable to dyspepsia and constipation for most of his life, more especially the last five months, during which he had been constrained to sedentary habits by a scald of one of his feet, barely healed at the time of admission. For three weeks before admission he had been suffering from painfulness and increasing prominence of the upper abdomen. On the evening of May 3rd he was attacked by severe pain like colic in the lower abdomen and at the navel, with which he was "doubled up for two hours." During the following week he kept his bed, having much sweating though no rigor.

When admitted on the afternoon of May 11th he was found to be a thin, wiry-looking man, feverish, and complaining chiefly of pulmonary

symptoms. He was short of breath, with some cough and scanty unstained expectoration, and at the base of the right lung behind were dullness and tubular breathing. The upper abdomen presented a tympanitic prominence, tender on percussion, the nature of which was not at first quite clear. In the course of the next three days the abdominal swelling increased, as did also the embarrassment of the right lung, while the patient acquired a dull aspect and complained of much discomfort. Respiration 42, pulse 94.

a, area of tympan. resonance; b, incision; c, edge of liver.