A CLINICAL LECTURE ON THE DIAGNOSIS AND OPERATIVE TREATMENT OF ACUTE INTESTINAL OBSTRUCTION DUE TO BANDS.

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ACUTE intestinal obstruction has occupied so much attention of late years, and the subject has become so large that I can only, within the compass of a lecture, limit myself to the consideration of a few points on one, but that a common, variety of the disorder.

Many cases of acute intestinal obstruction are highly difficult and complex. In numerous instances, too, the acute obstruction supervenes only on some chronic condition or on diseases of long standing in themselves obscure. With such I am not concerned. The complexity of the symptoms is often only due to delay in treatment, and a large number of these cases present symptoms at the outset that may be interpreted with ease and accuracy. The more knowledge we gain about these disorders the more does their mechanical nature in many instances assert itself; in other words a great proportion have a purely surgical aspect. I am far from asserting that many do not rightly fall under the care of the physician, but I think, in hospital practice at any rate, the rule that any case of intestinal obstruction should be seen at once by the physician and the surgeon together is a good one in practice.

I have selected for this lecture a class of cases which few will question fall directly within the province of the surgeon. It requires no long acquaintance with the clinical work of a general hospital to recognise that the disease, always formidable, is usually fatal. With a tendency, which I am afraid is not unknown in medical practice, to explain our own failures by throwing the blame on somebody else, we account too frequently for want of success (in less euphemistic phrase, the death of the patient), by the fact that the case came too late under treatment. Unquestionably, early recognition of the disease, if it leads to prompt treatment, is of paramount importance. Still these patients will, as cases of external strangulated herniæ do so often, come to hospital late. Improved diagnosis and improvements in operative procedure may still do much to counteract the serious drawback to success resulting from delay, and may extend the limit of time implied by the words "too late."

CAUSATION.

Into the causation of acute intestinal obstruction by a band I need not enter at any length. A very little reading on the subject will convince you that the variety of causes is tolerably large. I do not think that knowledge is advanced by the assumption that the exact nature of the band matters little. It may be some time yet before we can surmise with any reasonable certainty the precise form that will be found in an acute case. Already, however, we are often enabled to form a correct opinion. The more careful observations we have of the clinical symptoms and the more accurate records we have of these cases, the more diagnosis will improve. In a great number of instances the band or bands are due to old peritoneal adhesions. The history will lead you to suspect that an attack of localised peritonitis has occurred at some period previous to the acute disorder. Typhlitis, as it is commonly called, appendicitis as it really is, more frequently may have occurred. There may have been localised trouble after parturition, perimetritis, or the like, or a localised peritonitis may have been set up as the sequel of an attack of typhoid fever. It may safely be assumed that complete anatomical recovery does not take place after an attack of peri-

tonitis sufficient to cause peritoneal adhesions. Slight adhesions are more likely to give subsequent trouble than extensive matting of the intestines. A tag of omentum glued to some remote peritoneal surface or the adhesion of the free extremity of an appendix epiploica to a stray loop of gut forms just the sort of condition most to be dreaded.

SYMPTOMS.

In acute obstruction from bands the onset of the attack is not usually so sudden as is supposed, though the warning probably is insufficient to give the patient much concern. Generally there are some prodromata. Sometimes the patients complain of having felt a little out of sorts for a few days. Often the attack is preceded by some little intestinal disturbance, ascribed to a chill, an attack of diarrhoea, or the like. Then suddenly the symptoms of strangulation occur. There may be two explanations of this state of affairs. Either the irregular movements of the intestine may lead a coil to thrust itself beneath a pre-existent but harmless band, as in an external hernia which descends for the first time and speedily becomes strangulated; or the loop may have lain for an indefinite period beneath a band without grave symptoms, when suddenly, owing to the intestinal disturbance, in itself trivial, undue distension takes place, and the gut, as it were, tightens the halter round its own neck. Thereupon ensues a train of symptoms to be described presently.

Let me cite briefly a short series of cases which have fallen under my care, and which will serve to illustrate how improved surgical methods and diagnosis may enable us to work through failures to success. The first is but a sketch of a typical case which, though seen many years ago, is still acutely fresh in my memory.

CASE I.—A man, aged 28, had enjoyed good health save for an attack of typhlitis about two years previously. He had been feeling a little out of sorts for a few days, but was able to pursue an active life. Shortly after being exposed to a cold wind while on a journey, he was seized with suddenly intensely severe pain in the abdomen, and vomited almost immediately. The pain lasted for two or three hours, but diminished in intensity from the first onset. He vomited again several times. A short time after the first subsidence the abdominal pain recurred with great severity. Opium was now given; the severe attacks of pain were gradually subdued, and the vomiting ceased. From the first onset of the agonising pain to the end of the illness, ten days later, constipation was absolute. Some forty-eight hours after the first attack he complained of little beyond a feeling of abdominal discomfort. The pulse was fairly strong, the temperature about normal, respiration tranquil, the tongue clean and moist, and the mind perfectly clear. The expression showed but little distress or anxiety, and, indeed, in these cases what is called the "abdominal face" is prone to come on only at a stage when the chances of recovery are practically hopeless. Considerable quantities of opium and belladonna were taken. Foods of various kinds, stimulants, together with nutrient injections were given, and, if not digested and absorbed, at least tolerated. Enemata brought away, as usually happens, a few small fecal lumps. The desire to pass a motion led him several times to suppose that he was about to do so. An occasional feeling of sickness occurred such as might result from flatus. About the sixth day the sickness returned, and a large quantity of fluid food which had been partly digested was thrown up; still the tongue remained clean and the mind clear. There was very little distension of the abdomen, and hardly any tenderness on pressure. Then, with a little increased pain, distension began and gradually became more and more pronounced. The pulse became weaker, the respirations shallow and hurried, chiefly owing to the inability of the diaphragm to descend. Vomiting occurred again once or twice with little, if any, retching, the face became rapidly sunken, and the tissues seemed to dry up and shrink, but the mind remained clear almost to the last, and it was not till a few hours before death that the tongue became dry and coated. Another few hours and slight convulsions occurred, and a life that might have been saved was thrown away. *Post-mortem* evidence of old typhlitis was found. Two bands, some distance from each other, due to stretched peritoneal adhesions, were found obstructing the small intestine. In this case the question of operation was not seriously mooted until distension had set in, and there was some evidence of peritonitis, and it was then thought, and beyond doubt wisely thought, that the patient's strength would not stand the operation. Below the obstruction the gut was completely collapsed and above it greatly distended. All the other organs were those of a man in sound health.

The appearances after death in this case showed that the disorder was a purely mechanical one, and could have been relieved perfectly and easily by operation; further, there can have been no reasonable doubt that if the obstruction had been so relieved at the outset of the attack, the patient's chance of recovery would have been good. At no time in the history of this case did the vomit become markedly stercoraceous. Operate early in cases of complete obstruction by bands was the lesson that this case taught in the most emphatic terms. The patient died because the diagnosis was hesitating, and his case occurred at a time when operation was usually considered a desperate because a last resource.

CASE II.—The next case occurred in hospital now a good many years ago. The patient was a strongly-built policeman in good health. The onset of the disorder was ascribed to a chill while on duty. As in the previous instance, the attack commenced with sudden severe pain, associated with immediate vomiting, and relieved, as before, or rather rendered obscure, by the administration of opium. During the intervals of pain he seemed perfectly well and scarcely complained of even discomfort, but constipation again was absolute. Shortly after he first came under my care in the hospital, although the vomiting was not frequent or the vomit foul, it was decided, after consultation, to open the belly. Actually the delay had rendered the case almost hopeless. Still, with the ideas that then pretty generally prevailed, it seemed almost audacious to undertake so severe a measure in the absence of any very grave physical symptoms. You must recognise that the serious nature of this case was shown rather by the history which was given us than by the actual signs before our eyes. It is so easy to misinterpret or unconsciously distort the history a patient gives. The abdomen was opened, and in the region of the right sacro-iliac joint a band constricting the small intestine was at once found. The band was divided with ease. The distended gut above the obstruction seemed at once to pass its contents on as the collapsed gut enlarged a little. Matters looked hopeful, and, indeed, the symptoms were all relieved, save the constipation; but the man died.

I think that the operation in this case neither hastened nor retarded his end. It was a step in advance to operate when the symptoms were quiescent, but the right moment had gone by. There was no peritonitis or gangrene, or even ulceration of the gut, but the symptoms determined by the constricting band continued after its division as the result, we may suppose, of paralysis of the intestine. Here the obstruction had existed some five days, and death was due to the simple fact that the operation was too late. An operation, if it consists only in division of the constricting band, will generally be too late when the vomit has become at all foul and distension has commenced, for then the gut has become exhausted and powerless. Such cases may still be saved by other means, such as puncturing and draining the distended bowel. Owing to the late stage of the disease at which this patient was first seen, recovery by any operation was certainly improbable, but in the future more of such cases will be saved when neither ulceration, nor gangrene, nor peritonitis exist.

In the next case I need not detail to you the symptoms. They closely resembled in their early stages those I have already given; but I had come to see before this case came under my notice how essential it was to operate early; and I had come to recognise, also, by numerous other cases which I had myself seen or read of, that it was far better where the symptoms had such a definite character to run a risk which was little more than that of revealing by operation a mistaken diagnosis. The early sharp pain, the immediate occurrence of vomiting; the rapid subsidence, followed after an interval by recurrence of the same symptoms, pointed, as it seemed to me, now emphatically to a condition that could only be relieved by operation practised as early as possible. But it was some time before I had an opportunity of carrying this determination into practice; and one had to learn, also, that early operation, though an essential condition, was not the only one; other details had to be observed if the patients were to be saved.

CASE III.—A young woman came into hospital with a history almost identical with those I have already given you. The symptoms had continued for some days. I operated no long time after her admission. A single band was found in the usual place, and divided. The constriction did not appear to be absolute, and the gut seemed to have a fair chance of recovering itself, and, when a few hours after the operation she had a free action of the bowels, there seemed at last a reasonable chance of a successful case. But evidence of peritonitis was seen at the time of operation, and the mischief had spread to some distance from the seat of lesion. The vomiting ceased, and all the symptoms were relieved, but the peritonitis increased and extended down into the pelvis, and in a day or two she died.

No doubt it would have been better if the operation had been done earlier and before any peritonitis was started. Yet this case, I am convinced, might have been saved. This happened some years ago, before I, at any rate, had realised the importance of drainage in these abdominal cases, and on thinking it over afterwards I was forced to the conclusion that, notwithstanding the exhausted condition of the patient, it would have been proper to have flushed out the peritoneal cavity freely and drained.

In the next case I determined, if the symptoms and conditions in any way resembled those of any of the patients I have described, to carry this practice into effect. It was some time before an opportunity occurred. Cases, indeed, of acute obstruction from other causes were numerous enough, but it was

some time before one of acute obstruction from bands came under my care.

CASE IV.—At the beginning of 1893 a woman came in who gave a history of symptoms similar to the others. She had vomited, but the matter was not offensive. I saw her first late at night. She was then sitting up in bed to all appearances perfectly well. It was hard to credit her account, and judging by the physical symptoms, I doubt if she would have consented to any operation at the moment, even if I had suggested it. Unfortunately I did not do so at the time, but it was determined that if vomiting occurred again we would at once cut down. The next day it did occur, and I at once opened the abdomen. The obstruction was soon found in the usual place, but deeply situated and so closely held down that I did not dare to attempt to raise up and bring out of the wound the affected portion of the bowel. The obstructing band proved to be a Meckel's diverticulum. No sooner had this been divided and the ends secured, than the imprisoned length of bowel, now completely released, rose up from its bed. As it rose up the rotten wall at the site of constriction gave way, and tore open as a piece of wet blotting paper might tear. A few drops of the contents of the bowel escaped into the cavity before the gut on either side of the ulceration could be compressed. Although the patient was rather exhausted, there seemed only one thing to do. Some 4 inches of the gut, including the lacerated portion in the middle, were excised, and the ends joined together. Rapidly seemed the first essential, and I used no plates or special clamps for the bowel, merely stroking the contents back, and constricting it on either side just beyond the point where it was cut through with a piece of indiarubber drainage tube passed through the mesentery and round the bowel, and held in position by a clip. The mucous membrane was united by a continuous suture, and the serous coats by a continuous blanket suture—a form of stitch that appears to me to answer admirably in these cases. We flushed out the peritoneal cavity, and hoped that we had done so sufficiently to get rid of every trace of faecal matter. A glass drainage tube was put in. The patient went on well for a day or two, but then pelvic peritonitis started, and she died.

I do not know that in this case, even if I had correctly appreciated the condition, I could have prevented altogether the escape of some matter into the peritoneum, for the site of obstruction was very deeply situated. Although so short a time had elapsed between the first onset of the symptoms and the operation, the damage to the bowel was very profound.

CASE V.—The next case was a little more complicated, but yet the symptoms seemed easy enough to read. The importance of believing implicitly in the truth of the symptoms was well illustrated. A man, aged 44, gave the following history, which I will condense to the utmost. While travelling abroad he was attacked, after exposure to cold, with a little intestinal disorder. The next day he felt out of sorts, but went out in the hot sun. He felt sick and faint, and had severe gripping pain. After about two hours the attack faded gradually away, but recurred with less severity a few hours later, and was accompanied by slight diarrhoea. The next day he had merely some discomfort and diarrhoea, but no pain. Two days later he was well enough to journey home, and, though not feeling quite right, went about his usual avocations. A week after the first onset of the illness, being still a little uncomfortable and inclined to diarrhoea, he concluded to see a medical man. He called at the houses of two, but finding them both out gave it up, and it was not till nine days after the first attack that he consulted his own medical man, who found some localised tenderness in the neighbourhood of the caecum. A good deal of pain occurred at times, and he kept his bed for two days, but then, as the diarrhoea was less and he felt better, he got up and went about again. Twelve days after the original attack there was a sudden onset of very severe pain in the abdomen, lasting the greater part of the night, and attended by severe vomiting. Opiates were given, but a further attack of vomiting ensued. Forty-eight hours after the second set of symptoms began the pain had subsided, but there was some oppression and hiccough. When I saw him the evidence of appendicitis was plain enough, for the mass could be felt; but added to this there was a second set of symptoms. It was clear from the history that the original lesion could not have been due to a band, and it seemed no less clear that the second train of symptoms was due either to a band or to acute kinking of a coil of small intestine which had become adherent in the neighbourhood of the typhlitis. I confess that I rather inclined to the latter view. Immediate operation was counselled, and the advice accepted. I found some localised peritonitis, due to a perforation of the appendix. A small faecal concretion was lying loose in a little bed of lymph. A tense band, due to a drawn-out tag of omentum passing longitudinally, constricted about five-sixths of the lumen of the colon, and a coil of small intestine behind was pressed upon and partly occluded. The band was divided, and the concretion removed. No perforation could be seen, and the appendix was evidently concealed in the inflamed and thickened cellular tissue around the caecum. A search for the appendix and its removal seemed to be a formidable proceeding, and appeared also, under the circumstances, unnecessary. The peritoneal cavity was most freely flushed and drained. The convalescence was retarded by divers complications, the chief of which was enormous and suddenly occurring distension five days after operation. This distension was caused by a great block of pasty faecal matter high up in the descending colon, probably near the splenic flexure. A rubber tube was passed right up to the impacted mass, and a large enema injected. At the second attempt the mass moved on, and the danger, which for a time was very imminent, was averted. A similar attack occurred later on, owing to impaction in the sigmoid flexure. Again, the distension was extremely rapid, but was promptly relieved by the long tube. After this all went well, and the patient is now in perfect health.

CASE VI.—The last case that I need trouble you with is that of a woman who was recently in the "Princess" Ward. Twelve years previously she had had some abdominal trouble, of the nature of which I am uncertain. Seven weeks before admission she was seized with abdominal pain; no vomiting. Her bowels did not

act for four days. The patient's health had otherwise been good. About sixty hours before admission she was seized with typical symptoms, which I need not here recapitulate. The pain passed away, and the usual deceptive calm followed. The patient was in domestic service, and I went down to see her at her own house, as she was unwilling to be persuaded that her condition was urgent, and that prompt measures were imperative. I found the woman with apparently little the matter, for it was one of the cases which I pointed out to you as having periodic renewals of the symptoms. The constipation was absolute. The abdomen was soft, and not distended. Just above the umbilicus, on the right side, I could make out something hard, though almost in the middle line. Here, if ever, it seemed to me a case in which the courage of one's opinions was needed. Within three hours of my first seeing her I proceeded to operate in the hospital, though no fresh symptoms had occurred. Seeing that something could be felt through the abdominal wall above the umbilicus, I made my incision over the region where the mass could be felt. This, as it turned out, was a mistake, and I should have done better to make the usual median incision below the umbilicus. In the neighbourhood of the right sacro-iliac joint after some search I found a very tight band. The intestine below was collapsed, while above it was a deep claret colour, moderately distended, and showing marked traces of the efforts it had made to overcome the constriction. The induration that I had felt proved to be only the tense border of the mesentery. The band was probably a stretched peritoneal adhesion. The abdomen was flushed out with hot boracic solution, and a glass drainage tube kept in for about twenty-four hours. The only drawback to an uninterrupted recovery was due to some suppuration about the stitches—an occurrence that frequently takes place if, as in this case, some distension follows operation. Profiting by the experience of the last case I have mentioned to you, I took care not to let the bowels remain too long inactive. The ordinary senna draught of the hospital succeeded admirably when other purgatives failed.

There are a few practical points arising out of these cases to which I desire to call your attention.

WHEN IS IT DESIRABLE TO OPERATE?

On this point I desire to repeat, though it be for the hundredth time, that in cases where a band is reasonably suspected we cannot operate too early. After the first twenty-four hours the local condition of the part becomes infinitely worse than the general symptoms seem to indicate. During the interval between the severe attacks the intestine is but, as it were, resting and gathering force for fresh, but fruitless, endeavours to force the obstruction to yield. Picture to yourselves the commotion that must have taken place within the belly in these cases. A loop of gut is strangulated by a band. Immediately the most strenuous reflex efforts are made to overcome the obstruction, comparable almost to forcible taxis in hernia. The circulation in the intestinal wall is impeded and disordered. The vessels become injected, the whole wall of the gut gorged. More and more of the gut above the constriction is thrown into violent spasm. Ultimately the exhausted muscular tissue ceases its efforts, and the calm ensues. Meanwhile the gripped intestine, in its violent struggle to get free, probably drags down or displaces the mesentery, thus further hindering the circulation. The obstructed portion may shift its position, and further entanglement of the bowels ensue. After a while the serous coat becomes covered with lymph and neighbouring coils adhere together; and during all this time the wall of the bowel where constricted, at first bloodless and pale, becomes ulcerated, the mischief commencing in the mucous layer. What can drugs, be they opium or belladonna, or purgatives, what can enemata do to relieve such a condition? And what can delay do save convert a simple and hopeful case into a complicated and hopeless one?

In the great majority of cases the symptoms of band are really almost unequivocal. When they are so clearly marked it is mere fatalism to abstain from operating, and even if the symptoms, though due to a band, chance to be obscured by complications, operation will almost always be expedient, and invariably be justifiable. I am altogether of Mr. Greig Smith's opinion with regard to what are called "exploratory" operations. "No incision," he says, "ought to be merely exploratory; at the utmost it ought to be ultimately diagnostic in a case of extreme doubt and difficulty." As a means of obtaining information, when all else fails, it is occasionally right; as an aid to a slovenly diagnosis it is worse than wrong. While preparing for all eventualities, you should have a clear idea in your own mind of what you will probably find, and in the case of bands you will very seldom be wrong. You may not be able to tell the precise form of band, or distinguish between a tag of omentum or a peritoneal adhesion, but you can feel almost positive of the essential nature of the disease. If you keep a picture of the clinical progress of these cases in your mind, you will gene-

rally arrive at a just conclusion; but you must believe in the truth of the symptoms. Few cases have less misleading symptoms.

AS TO THE INCISION.

Make this, in the absence of very clear indications to the contrary, in the middle line and below the umbilicus. Through this opening you can easily reach the sacro-iliac joint, and you are more likely to be clear of any adhesions that may have formed. I believe it is better to cut through the rectus muscle just on one side of the linea alba, rather than keep rigidly to the very middle. Pass your finger at once to the right sacro-iliac joint. Almost any form of obstruction will reveal itself to the touch as an undue induration. If a little fluid gushes out when you first open the peritoneum, you may feel certain that you have to deal with an obstruction. If you do not discover the site of the mischief at once by these manipulations trace along the gut up or down: but be definite in your proceedings.

If there is collapsed gut as well as distended, begin with the former for choice, follow out its whole length first in one direction and then in the other, but do not hesitate and go first up and then down. Keep the intestine warm and keep it moist. Gentle irrigation with hot boracic solution is, perhaps, the best method. When you reveal the site of obstruction, try to raise it to the surface, and deal with it outside the abdominal cavity. Often it cannot be drawn up at all. Then the intestine around must be gently held back, and the nature of the band determined. If a peritoneal adhesion, be sure that it does not include a drawn out portion of the intestinal tube. Before dealing with the adhesion let the assistant grasp the intestine lightly between his fingers on either side of the constriction, lest ulceration having taken place escape of fæces follow the division of the band. The moment the band is released or divided the whole appearance will change quite suddenly. In many cases the cut ends disappear suddenly, and cannot be found again, and even the constricted portion of the gut may be hard to discover. Note if the circulation returns at once through the constricted portion. The collapsed gut may become fuller a little at once, and yet paralysis may prove fatal. If there is serious doubt, it is better I think to resect at once a large piece of the intestine.

Rapidity of operation is of cardinal importance, and any form of procedure, such as multiplication of sutures, is to be deprecated. With regard to rapidity in operating you can hardly approach too near the limit that separates speed from haste.

If a patient's condition is too bad to allow of resection, bring a coil of intestine out of the wound, secure it after Mr. Greig Smith's method, tie in a glass tube into the distended gut, and drain in that way. This is infinitely better than making an artificial anus. Nearly all the patients thus treated die. In most cases where you consider it desirable to flush, it is advisable to drain the peritoneal cavity. Instruct the nurse to turn the glass tube once completely round every time she draws the fluid out with the syringe, otherwise the openings in the tube will become choked, and when you take out the tube finally it will give pain, and, worse still, lead to a little bleeding, and probable subsequent trouble. Take the utmost care to prevent any sepsis from extending along the tube itself or by its side. Suppuration along the track of the drainage tube, though not of itself very serious, delays convalescence; though difficult to avoid, it is still preventable.

AFTER-TREATMENT.

I am unwilling to lay down any formal rules. In general the principles are very simple. Opium is not usually necessary, and is, I think, to be avoided when possible. Do not keep your patient too long without any food by the mouth. Generally some must be given after the first twenty-four hours, and some is often desirable still earlier. In fact, you may give food, fluid of course, directly you think the stomach can bear it. Do not allow the bowels to remain inactive again too long. There is an extraordinary tendency in these cases to administer purgatives before the constriction is relieved, and to withhold them after. Both practices are constantly pursued to an injurious extent. If you believe that the colon is loaded injections must be trusted to mainly; the purgative mineral waters will often answer admirably.

If the small intestine is likely to be paralysed to some extent, the common black draught will answer excellently, or castor oil.

Flatulent distension occurring after operation may become a very formidable symptom, and is to be guarded against most carefully. Long injection tubes made of rubber are far safer to use than the gum elastic tubes ordinarily supplied by makers. Puncture of the bowel through the abdominal wall has been recommended, but I cannot say that I am in favour of the method. Other means short of laparotomy have been advocated by high authorities, notably by Mr. Jonathan Hutchinson. Manipulations, shaking, and even inversion of the patient pursued on a definite system have relieved cases presenting symptoms of obstruction, but not often, I fancy, the class of cases with which this lecture deals.

If it is a kink you may succeed; if it is an impaction of faeces causing an actual obstruction in itself, or producing one by pressure on another coil, you may succeed; and I doubt not in other of the less grave forms of obstruction the practice is not unreasonable. But if it is a case of band with such symptoms as I have described, such methods will fail in the huge majority, while in the exceptional case your laparotomy would have been absolutely justified. In some you will find an irremediable condition. In some there will be found disorder, which, though possibly amenable to milder measures than laparotomy, can yet be efficiently treated by that means. In some you can but make the diagnosis certain, as for instance in tuberculous peritonitis, but this may be a great gain. Of the two evils, indiscriminate operation would be far better than universal expectancy.

ON THE VALUE OF THE BACTERIOLOGICAL DIAGNOSIS OF ASIATIC CHOLERA.

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"BACTERIOLOGICALLY indistinguishable from Asiatic cholera" is an expression which, to some, will undoubtedly convey a feeling of doubt concerning the value of the bacteriological diagnosis, whilst for those who believe that the spirillum cholerae Asiaticae is the cause of the disease, the same expression leaves absolutely no doubt as to the nature of the case; the presence of the comma bacillus "constituting an infallible diagnostic sign of the existence of the disease."¹ The diagnosis of cholera is by all acknowledged to be based on evidences of four kinds (1) clinical, (2) anatomical, (3) epidemiological, (4) bacteriological.

CLINICAL EVIDENCE.

The clinical diagnosis presents serious difficulties, for (A) the symptoms, even of undoubted cases, vary much in intensity and in sequence. (B) Other illnesses may closely simulate Asiatic cholera: among them may be mentioned cholera nostras (English cholera, summer diarrhoea, infantile diarrhoea), perforation of the stomach and bowel, cold stage of remittent fever, poisoning by certain organic poisons (muscarin, croton oil, food poisoning), poisoning by certain inorganic poisons (arsenic, nitrites—the latter according to Emerich and Tsuboi).² All the essential symptoms of Asiatic cholera—namely, (1) diarrhoea with rice-water stools, (2) vomiting, (3) cramps, (4) suppression of bile and urine, (5) pinched expression and lividity, (6) extreme prostration and collapse, (7) coldness of surface but not of rectum, (8) reaction or fever in cases not dying in the stage of collapse, (9) death in a certain proportion of cases—may be observed in severe cases of cholera nostras, in which, however, suppression of urine and bile are seldom seen. Unfortunately for the diagnosis, suppression of bile and urine may be absent in typical epidemic cholera. This difficulty is so great, that Koch³ himself has said that when an epidemic of cholera has reached its acme, cases of acute diarrhoea, with vomiting and cramps, may be considered as choleraic without bacteriological analysis. (c) The difficulty is still further increased by the fact that

some cases of alleged cholera, as diagnosed by the bacteriological method, show absolutely no symptoms.

ANATOMICAL EVIDENCE.

The anatomical diagnosis of cholera is still more difficult than the clinical. Typical lesions of the intestine, and even typical stools are found only in a certain proportion of cases.⁴

EPIDEMIOLOGICAL EVIDENCE.

The epidemiological notion must evidently be combined with the clinical and the anatomical diagnosis, since it is only the occurrence of cases which points to the existence of an epidemic.

It is well known that in the absence of any evidence of the importation of Asiatic cholera many cases, which in time of epidemic would be attributed to malignant cholera, are called cases of summer or English cholera. When an epidemic is raging, on the contrary, such cases would be described as examples of epidemic cholera (see Koch's statement above).

That this is a source of great confusion is shown by certain occurrences. There have been epidemics of choleraic disease in which the evidence of importation from Asia or from an infected country has been doubtful; this was the case with the Paris epidemic in 1892; the absence of evidence of importation led the authorities at first to give the name of *diarrhée cholériforme* to these attacks; yet a bacteriological examination of several of these cases proved the presence of the cholera spirillum (Netter, Metchnikoff).

The difficulties in this respect are considerably increased by the occurrence of local outbreaks undoubtedly connected with the supply of impure water—London, 1866; Marseilles, 1884, 1892; Paris, 1892; Hamburg, 1892; for these are capable of more than one interpretation. Moreover, cases, apparently sporadic, seem to have increased of late years, since the bacteriological diagnosis has come into use.

From what precedes it is evident that before the bacterial method was introduced the diagnosis of cholera was based on a certain combination of evidences clinical, epidemiological, and to a certain extent anatomical; and that these were not always conclusive.

BACTERIOLOGICAL EVIDENCE.

The bacteriological diagnosis is, according to Koch's latest publications,⁵ to be obtained by means of the following tests:

1. Microscopical examination of the faecal matter stained with a dilute solution of carbolic fuchsin.
2. Cultivation in salted, peptonised water, at 37° C.
3. Cultivation on agar at 37° C.
4. Gelatine plate cultivation at 22° C.
5. Testing for the presence of indol and nitrites in pure cultivations in peptonised water (cholera red).
6. Intraperitoneal injection of a minute dose of a 20-hours cultivation on agar in a guinea-pig weighing from 300 to 350 grammes.

But Koch justly remarks that several of these methods have a limited value in themselves. Thus the simple microscopical examination is only available in 50 per cent. of the cases, even in the hands of the most experienced observers.

The cultivations on agar are used chiefly for the purpose of getting bacilli for peritoneal injections, and the plate cultures for the purpose of separating the bacilli (for the rate of liquefaction has had to be abandoned as a diagnostic test).

When morphologically typical spirilla have been found to be present in the intestine of a patient, the only two tests which may be relied upon are (A) the indol-nitrous reaction (cholera red), (B) the virulence of the cultivations on agar to guinea-pigs; and the cholera-red reaction seems to be the more important of the two, for Koch has said, "None of the curved bacteria known until now does produce at the same time, when cultivated, indol and nitrous acid, and gives the characteristic reactions of cholera red."⁶ So great is Koch's confidence in the bacteriological diagnosis based on these tests that he considers men apparently healthy, in the solid stools of whom cholera bacilli have been found, as genuine cases of cholera. Such persons, he avers, have always been exposed to the influence of infection.

Unfortunately the comma bacilli are not present or, at any rate, easy to demonstrate in cases where reaction has set in,