A CASE OF SPREADING PERITONITIS CURED BY DRAINAGE OF PELVIS, THE FOWLER POSITION, AND RECTAL INSTILLATION OF SALINE SOLUTION.*

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MAYO ROBSON'S definition of a spreading peritonitis¹ is as follows:

By a spreading peritonitis I mean one in which there are no lymph barriers, but in which the peritonitis has not yet involved the whole cavity of the peritoneum.

In the following case there was involvement of the peritoneum below the level of the transverse colon.

The patient, an anaemic young woman, unmarried, aged 21, was seen in consultation with Dr. J. E. C. Wilson of Devonport on November 24th, 1906.

Previous History.—Menorrhagia since the age of 15. Three years ago a severe haematemesis. Intermittent dyspepsia since. Normal period ceased four days ago.

Present Illness.—Three days ago, at 5 a.m., while in bed, the patient had very acute pain in the epigastrium. She did not faint. The pain has recurred at frequent intervals.

Present Condition.—Abdomen very distended, universally tympanitic, only slightly tender, the tenderness being most marked in the epigastrium. Respiratory movement very slight. No liver dullness in right nipple line. Borborygmi audible in left iliac region. No tumour felt either in abdomen or per rectum. Patient during the past forty-eight hours repeatedly sick. Pulse, 115. Temperature, 99.8°.

Diagnosis.—Perforated gastric or duodenal ulcer.

Operation.—At patient's house. Anaesthetic, ethyl chloride followed by ether. Operation by lamplight, with patient semi-erect. Median incision above umbilicus. The stomach, moderately distended and normal, and the transverse colon, enormously distended by flatus, were drawn from the abdomen. On passing the hand from incision towards pelvis there was a flood of brown turbid, stinking fluid, the odour resembling that of an appendix abscess. Adherent lymph was seen on the under-surface of the colon, the small intestines being distended and injected. The distended colon required puncture and suture in two places before it could be replaced. A rubber tube of $\frac{1}{2}$ in. lumen was passed to the bottom of the pelvis through a suprapubic incision. No effort was made to wash or swab out the turbid fluid, and no further exploration of the abdomen was attempted. The upper incision was closed, without drainage, by mass sutures of silkworm gut. The operation lasted three-quarters of an hour, the greater part of this time being occupied in emptying and replacing the distended colon and in closing the incision. The patient was carried back to bed in a sitting position and at once propped at an angle of 45°, and continuous rectal instillation of warm saline solution commenced. The pulse at the end of the operation was 140.

After-Progress.—The patient rallied at once, the vomiting ceased, and her expression, instead of being drawn, became placid. The saline instillation, of which about 3 pints were absorbed in the first two days, was continued for three days, the patient, after the first twenty-four hours, being able to take large quantities of liquid by mouth. During the first twenty-four hours, $1\frac{1}{2}$ pints of urine were secreted, while brown stinking fluid was withdrawn through the suprapubic opening. The pulse and temperature gradually dropped, and on the fifth day were 100 and 98° respectively. The bowels for the first four days produced a brown foul liquid, and later acted well in response to saline enemata. The abdominal distension entirely subsided. The silkworm-gut sutures were removed on the twelfth day, the wound being healed.

COMMENTS.

Prior to operation, the symptoms, signs and history pointed to a lesion in the epigastric region. Operation showed the infection to be in the lower abdomen. The infection probably originated in the appendix, although it is impossible to exclude an infected ovarian cyst or Fallopian tube as a possible, though improbable, source. Whatever the cause, the lower abdomen was infected with bacteria from the intestine.

Recovery was due to drainage of the lower abdomen, and the Fowler position combined with continuous rectal instillation of saline solution.

Accessory factors were the shortness and simple nature of the operation, the semi-sitting position during operation and during removal to bed, the fact that the severely-poisoned patient was not further reduced in vitality by removal to a nursing home or hospital, and that ether was the anaesthetic employed. Taking these points in detail:

1. The Fowler Position, etc.

The object of the Fowler position is to prevent infection of the upper abdomen, which is far more fatal than an infection below the level of the transverse colon, absorption taking place much more actively through the lymphatics of the diaphragm than through those of the pelvis.

If infection of the upper abdomen has already taken place, the infective fluid is given a chance of gravitating to the pelvis, where it is least harmful and can be removed by drainage.

Another advantage of this position is that, in a patient with a distended abdomen, the heart and lungs can work much more easily in the semi-erect than in the recumbent posture.

The continuous supply of saline solution per rectum supplies the patient with the water of which he has been deprived by vomiting and starvation, and causes a copious secretion of peritoneal fluid, rich in leucocytes and opsonins, which washes the peritoneum from above downwards.

Murphy of Chicago considers that the copious supply of fluid "reverses the current of the lymphatic stream, so that, instead of absorption taking place from the peritoneal surface, the mouths of the lymphatics pour out fluid which bathes the peritoneum and carries the infection down to the pelvis." The kidneys act freely and perform their share in eliminating the poison.

The effect of the saline solution on the renal secretion is shown by the fact that in this patient, who for the forty-eight hours prior to operation had vomited repeatedly, and who in the twenty-four hours following operation took nothing by mouth, the kidneys in the first twenty-four hours were able to secrete $1\frac{1}{2}$ pints. In some of the recorded cases this activity of rectal absorption and renal secretion has been even more marked.

A patient with an infection of any region of the abdomen should be at once placed in the semi-sitting posture, and maintained in this position during removal to and from the operation table, during the operation, and during the first days of convalescence.

It is illogical to allow a patient with septic peritonitis to be laid flat on a stretcher or to be carried on a stretcher upstairs feet foremost or downstairs head first. A more effectual way of infecting the upper abdomen could not be devised.

Unless this point is attended to, there is considerable risk that the efforts of the surgeon to limit the infection to the lower abdomen will be neutralized by the hospital porters.

2. The Shortness of the Operation.

In these severely poisoned cases, act on the American maxim, "Get in quick—and get out quicker." Do as little as possible.

If a viscus in the upper abdomen is leaking, the perforation must be either closed or shut off. If the infection is limited to the lower abdomen, unless the source of the infection can be quickly shut off or removed, it is inadvisable to do more than drain the infected area, by loin, above the pubes, per vaginam, or by all these routes.

With free drainage, Nature will localize the infection. A long operation, theoretically perfect, too often results in the death of the patient, whose life might have been saved by the exercise of elementary common sense.

3. Moving of Severely Poisoned Patients.

A person severely poisoned, or severely injured, is not in a state to stand being carried about. In any given case it is impossible to say that a fatal result would not have occurred, but it is absolutely certain that when such a patient has been carried about and then dies, if any chance of recovery remained to this patient before being carried about, this chance has been obliterated by the unreasonable procedure adopted.

The argument that the patient's surroundings render operation in the patient's home inadvisable or even impossible is entirely fallacious. For the operator it is naturally easier to work in a hospital or nursing home. The man who can only operate successfully when surrounded by aseptic luxuries is but a poor surgeon.

4. The Anaesthetic.

In this, as in most operations, the stimulating action of ether makes it far preferable to chloroform with its depressing effects.

* Read at a meeting of the South-Western Branch of the British Medical Association.

Operators who cannot operate during ether anaesthesia, because of the increase in the respiratory movements, might with advantage pay a visit to the United States, where ether is used almost exclusively, and where nothing is heard of "abdominal excursions."

For cases of septic peritonitis, ether, especially if given by an expert, as in the above case, is almost ideal.

REFERENCE.

¹ *Lancet*, December 29th, 1906, p. 1767.

PRELIMINARY NOTE ON THE LIFE CYCLE OF A SPECIES OF HERPETOMONAS FOUND IN CULEX PIPIENS.

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It is well known many insects are infected with harmless flagellate organisms the majority of which are very imperfectly known, the adult forms having alone been described. A large number of these parasites belong to the genus *Herpetomonas*, and are characterized by the absence of an undulating membrane, the flagellum passing out directly from the anterior end. Excepting a short account of *Herpetomonas subulata* by Léger,¹ which I shall refer to later, the only description of the development of one of these parasites is that of *Herpetomonas muscae domesticae* by Prowazek,² who in addition to giving a detailed account of its structure, mentions three possible methods of infection and a complicated process of propagation.

In December, 1905, when feeding mosquitos (*Culex fatigans*) on cases of kala-azar, it was found that a small percentage of the females were infected with flagellates very similar to the cultural forms of the Leishman-Donovan body, and a little later Christophers saw similar parasites in the males of *Culex fatigans* and certain developmental stages in the larvae. As far back as 1898 Ross found these flagellates in the larvae, nymphs and adults of *Culex fatigans*, and since then Léger and others have found similar parasites in the intestinal tracts of many insects.

The similarity between the developmental forms of the Leishman-Donovan body in the bedbug (*Cimex rotundatus*) and these flagellates of insects has led to the careful investigation of the life-cycle of a species of *Herpetomonas* found in *Culex pipiens*. Having seen certain stages of these flagellates in the larvae and the mature parasites in the faeces of the adult mosquitos, I concluded that the larvae probably became infected by ingesting the flagellates passed into the water. The hind gut of a larva was dissected out, the anterior portion isolated, spread out on a slide with two fine needles, and stained deeply with Giemsa's stain. Lying apparently in the gut, and in many cases close up to the nuclei of the intestinal cells, there were a number of round and oval parasites (Fig. 1), measuring from 4μ to 8μ in length and from 3μ to 5μ in breadth; their protoplasm, stained deep blue, was granular, and contained a few vacuoles. The macronuclei, which were circular in shape, staining light pink, and containing a number of fine chromatic granules, were usually seen lying at one end, while the micronuclei, staining almost black, were rod-shaped, and situated at the periphery or the centre of the parasites. Many of these cells, which were much enlarged, were seen in all stages of simple longitudinal division (Figs. 3a, 4a, and 5a), and in some the macronuclei and micronuclei had divided a number of times and arranged themselves along the periphery, and on the protoplasm dividing from four to six parasites were produced (Figs. 3b, 4b, and 5b). All these changes were seen taking place while still attached to the wall of the hind gut; some of the parasites had already flagellated, and were lying in pairs (Fig. 8b) with flagella of varying length, and had undoubtedly resulted from the longitudinal division of the round and oval parasites. In the nymphs some of the free forms had increased considerably in size, their macronuclei and micronuclei dividing again and again, resulting in the formation of rosettes (Figs. 6a, 7, 8a, and 9). In the older nymphs the individuals had flagellated, and the rosettes were beginning to break up, and in the adult mosquitos

the parasites were seen as elongated spindles with oval macronuclei and rod-shaped micronuclei lying between them and the anterior ends, from which long wavy flagella protruded (Fig. 11).

From this short description it will be seen that this parasite has a stage in its development when it is very similar in form to the Leishman-Donovan body, and, further, that it multiplies by longitudinal division and multiple segmentation* as that parasite does in the human tissues. When free in the hind guts of the larvae and nymphs it further multiplies in a similar manner to the Leishman-Donovan body in the bedbug.

Though there are still some gaps in the life-cycle of the *Herpetomonas* of *Culex pipiens*, enough is already known to compare it shortly with *Herpetomonas muscae domesticae*. Prowazek regards the parasite of the house fly as a bipolar flagellate in which the body has become bent so that the two ends have fused, the two flagella remaining distinct. Excepting the forms showing longitudinal division, I have never seen a single parasite with two flagella; further, there is at present no evidence of the bipolarity of any flagellate. In addition to the motile forms, Prowazek describes gregarine-like parasites, and believes their appearance confirms Léger's view of the relationship of these flagellates to the gregarines. I have frequently noticed these so-called gregarine-like forms both in the development of this parasite and in that of the Leishman-Donovan body, and they appear to represent either parasites whose flagella have not yet developed or have not been sufficiently stained.

Prowazek does not mention any stage in the development of *Herpetomonas muscae domesticae* similar to that of my parasite in the hind gut of the mosquito larvae. He describes a process of copulation in the parasites of the house fly prior to which there is a marked reduction in the flagellate apparatus, and two similarly constituted forms are then seen lying side by side. The macronuclei and micronuclei of the two parasites then unite to form a single macronucleus and micronucleus, and later a permanent cyst is formed which is passed out in the faeces of the fly. Prowazek also mentions three methods of infection: (1) The indifferent individuals from the cysts may be again taken up by flies; (2) the sexually differentiated forms copulate, forming a permanent cyst, which is passed out in the faeces and may be ingested by other flies; (3) sexually differentiated forms penetrate into the ovaries, where they undergo autogamy and infect the next brood, but no description of the parasites in the eggs is given.

I have so far been unable to observe any sexual process in my parasite and the examination of ovaria and eggs has proved negative.

I have also been able to follow some of the stages in the life-cycle of a species of *Crithidia* found in a small Homoptera. In the mid gut of the young nymphs of this water-bug there were similar round and oval bodies (Fig. 12) apparently lying in the epithelial wall with circular macronuclei and rod-shaped micronuclei. Longitudinal division was also observed resulting in masses of round and oval forms attached to the epithelium, but there was no evidence of multiple segmentation. While still attached flagellation takes place, and these parasites are then seen undergoing equal and unequal longitudinal division resulting in forms of all sizes.

The adult parasite is a long, sickle-shaped organism (Fig. 13) with both ends attenuated, the anterior being prolonged as a rudimentary undulating membrane along which the flagellum is attached. This parasite is very similar to *Herpetomonas subulata* described by Léger from *Tabanus glaucopsis* and *Haematopota italica*, of which he recognizes two types:

1. *Formes monadiennes*, represented by the adult flagellate, which is a long attenuated parasite with a central macronucleus and a round or rod-shaped micronucleus situated near it; both ends of the flagellate are drawn out, the anterior being prolonged as a rudimentary undulating membrane to which the flagellum is attached.

2. *Formes grégariennes*, represented by oval or round parasites which are usually seen lying in masses attached to the epithelium. These forms undoubtedly represent the earlier stages in the development of the parasite, which are characterized by longitudinal division and development of the flagella.

* It is interesting to note that Schaudinn depicts very similar herpetomonad methods of multiplication in his figures of the spirilliform stages of *Leucocytozoon ziemanni* in *Culex pipiens*.