the duty of testing the students at their work, and by a simple arrangement a uniform standard, though not necessarily a stereotyped one, in the technique of medicine could be established and then maintained throughout the country. The "doctor" would receive the stamp that he possesses a sound technical training and a substantial knowledge of medicine, and I have no doubt he would be a better man than the one who now finds himself licensed to practise.

In instituting such examinations certain principles underlying their proper conduct should be kept in view, and to my mind these principles are embodied in the following:

1. That the examination should be a test in the work actually done by the student.

2. That it should be conducted where the teaching was undertaken.

3. That the test should be applied at the end of each complete course of training.

4. That the Board of Examiners should consist of at least three persons—namely: (1) The teacher; (2) a representative of the corporation or university the student is attached to; and (3) a representative from the General Medical Council. The duties of the first two should be to conduct the examination and to award marks, the duty of the last to see that a due standard of proficiency in all the technical portions of the work is attained by each candidate.

If this were done it would practically mean the establishment of a "common State qualification" having a standard in technique that must be attained by all who desire to enter upon the duties of the profession of medicine. All would then be doctors in the ordinary acceptance of the word, and a new title might be created. We should then no longer have the L.S.A., the M.R.C.S., L.R.C.P., etc., which in reality mean nothing much more than that an examination was held in one part of the kingdom, another in another, a third in Scotland, and a fourth in Ireland, and so on. Rivalry in examinations is not worth any trouble expended upon it, but rivalry in teaching in the different schools means everything to the doctors, and in the end to the public they will serve.

I can almost hear some of those who will read this cry out, "What will become of the universities, old and new, and the royal corporations under such a scheme?" Well, I think all that need happen is that these bodies turn their attention to the further encouragement of learning in all its branches, and to show their graduates that an ordinary State qualification, though sufficient to give all the State privileges, just gives all that which is necessary and not all that which is known and may be desirable. By further study useful knowledge may be gained, and I would reward men who carry their studies further by establishing degrees in the science of medicine proper, in that of surgery, in that of midwifery, and in that of hygiene. The examinations for such degrees would not be hampered in any way whatsoever by the General Medical Council, for it would have no business with them.

CONCLUSIONS.

In conclusion it may be well to collect my suggestions:

1. The General Medical Council to throw upon the medical schools the responsibility of training and certifying the medical student as a fit and proper person to enter a hospital for training in clinical work; the machinery for giving such training to be under the inspection and supervision of the Council, so as to ensure that each medical student is given facilities for proper training.

2. The clinical training to extend over a period of three years, and each student to be examined in the work done at the end of every complete course.

3. The certificates for each course to form the record of the student, and as soon as all certificates are duly filled the student to be entitled to State registration and to all the privileges such protection affords.

4. The universities and the royal colleges too, to encourage the best men to continue their studies and to proceed to examinations to test especially the quantity and quality of their knowledge in any branch, and to grant degrees, say, in the science of medicine, in that of surgery, of midwifery, and of hygiene, or whatever else may be thought desirable.

ABDOMINAL SECTION UNDER SPINAL ANALGESIA, WITH OR WITHOUT THE AID OF GENERAL ANAESTHESIA.

WITH NOTES OF SIXTY-FIVE CASES.

BY

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ALTHOUGH the intraspinal application of drugs is rapidly taking its place as a recognized and approved method of anaesthesia, and has, so far as the rectum, bladder, groins, and lower extremities are concerned, largely replaced general anaesthesia in certain hospitals, it has not as yet proved itself absolutely satisfactory in all cases when applied to abdominal surgery. The extraordinary efficiency of such drugs as stovaine, novocain, and tropacocaine in the abolition of pain during operations on tissues governed by the systemic nervous system is to a certain degree lacking when the internal organs are submitted to operation under its influence. The results are uncertain, especially with regard to the depth of analgesia, and this uncertainty appears to be due rather to individual characteristics of the subject than to the variety of drug used, its particular dose, or to the height to which it is pushed. Thus two different patients of the same physique submitted to similar doses of the same drug, and exhibiting systemic analgesia to a similar height, will often, when the abdomen is opened and the organs are submitted to very much the same degree of manipulation, react in a totally different manner. For one may experience no discomfort whatever, while the other becomes nauseated and complains of dragging pain in the chest, which, for lack of a better term, I have called "pectoralgia"; one will require nothing but the injection already given to complete his operation, while the other will require the assistance of a slight amount of a general anaesthetic. Whatever else this diversity may be due to, it is certainly largely determined by individual sensibility, racial characteristics, the element of sex, and that of neurosis. The upper regions of the abdomen especially appear to be only slightly controlled by the intraspinal injection, even when the analgesia of the systemic nerves is fully established to a height above that which corresponds to the rami communicantes of the splanchnic area involved in the operation. Thus the analgesia may be pushed to the clavicles, and yet a gastro-enterostomy may be impossible of accomplishment. That this is not due to interference with the vagus terminals is shown by the fact that the same sensations at times attend the handling of other organs not supplied by this nerve.

These sensations of nausea and pectoralgia are especially evoked by traction upon or the application of pressure forceps to the parietal peritoneum, the stomach, the mesentery, and upper portions of the intestinal tract. Even in a simple exploratory laparotomy discomfort may be present all the time the abdomen remains open, being aggravated by the passage of the hand to its different quarters, and ceasing at once upon its closure. This would seem to point to the existence of a hyperaesthesia of the peritoneum rather than to a hyperalgesia of the organs themselves.

The lower half of the abdomen is much less affected than the upper, and most operations can be completed here without difficulty; but even here one meets occasionally with a refractory peritoneum, and a simple appendicectomy may require a brief period of general anaesthesia.

So far as I have been able to ascertain from a perusal of my own cases and from those of other surgeons, nausea and pectoralgia are the only two symptoms of any importance at all constantly associated with dragging upon or compression of the abdominal organs. I have certainly seen a slight fall of blood pressure and diaphoresis, but only occasionally, and not in any way associated with shock, being quite temporary in character; and indeed it is doubtful if these latter symptoms are in any way due

to the manipulation, as they are not infrequently seen for a brief period during the early stages of the analgesia where the operation is not a laparotomy at all.

Now it may be asked why I stand as an advocate of a method which would at first sight appear to be so uncertain, and what is to be gained by its use. In the first place, I advocate it because it is an advance—I believe a considerable one—towards the realization of a safer and sounder method of anaesthesia than that which we at present possess, and which, if not as yet perfect, will in due time and with greater experience become so. I advocate it also because *in those cases in which it has succeeded unaided by any general anaesthetic it has already proved itself perfect*, and these cases, I am glad to say, form the majority of those which form the subject matter of this paper. As will be seen—with one exception (No. 59)—I have not included any cases of inguinal or femoral hernia, although in many of the former, especially those of gigantic hernias treated by my own double-filigrée method, large masses of omentum and several feet of bowel have frequently had to be manipulated, my reason being that the majority of surgeons would not be willing to allow that inguinal hernia is, strictly speaking, an abdominal condition nor its radical operation an abdominal section. Further, the parietal peritoneum forming the sac of a hernia does not appear to retain the same degree of sensitiveness as that of the abdominal cavity proper. Nor have I included any cases of appendicular abscess, since in these the peritoneum is shut off.

As regards the advantages to be gained by the employment of spinal analgesia alone or in combination with general anaesthesia, I would offer the following remarks, which, in conjunction with the appended notes, will, I think, bear out my contentions.

I. THE ABOLITION OF SURGICAL SHOCK.

Sufficient time has now gone by and sufficient experience has been gained to permit those who are especially conversant with spinal analgesia to state definitely that surgical shock, even where the analgesia has not wholly dominated the splanchnic area, is very largely, indeed in most cases entirely, abolished. In the list of my own cases there is not one, even where general anaesthesia has had to be given, in which there was any sign of shock, and yet some of them were severe and prolonged, often in nervous women, and at times in men and women of poor physique and lowered vitality. If this is so, it is surely an indication for the use of the intraspinal injection, if only as a prophylactic, even in cases in which one cannot reasonably expect to complete the entire operation under its influence.

I have repeatedly adopted this method during the last two years, and have every reason to be satisfied with it. The only real objection to be urged against it is the possibility of having to employ the Trendelenburg position, for if the analgesia has risen to the height of the ensiform cartilage, or even higher, and chloroform has then to be administered and the Trendelenburg position adopted, it is, of course, possible that with the active respirations of the patient and the downward trend of the spinal theca the drug may rise to a still greater height. As a matter of experience this is little likely to occur after a period of fifteen to twenty minutes from the time of injection, unless the initial rise has been unusually high and rapid, when, in most cases, general anaesthesia will not be required. It must also be remembered that it is not every abdominal section that requires the Trendelenburg position. It is chiefly in operating upon the upper regions of the abdomen that general anaesthesia is useful, and it is just in such cases that the Trendelenburg position is unnecessary. In cases in which its need is anticipated, it is well to stop the rise of the analgesia when the sixth dorsal area is reached. By the time the patient is prepared, and the surgeon and his assistant are ready, or at least by the time the abdomen has been opened and the preliminary investigations have been made, the patient may as a rule be placed in the Trendelenburg position without fear of any further serious rise of the drug in the theca. In fact, I have usually found it impossible, after this period, to get any further rise without the use of a second injection. As regards the possibility of running the analgesia higher than the origins of the phrenic nerves without causing diaphragmatic paralysis by

the strychnine-stovaine method of Jonnesco,¹ I am by no means convinced that such success as I obtained in 1909² was due to the use of strychnine, as I have repeatedly seen analgesia reaching the clavicles without the least sign of intercostal paralysis when stovaine alone was used; and I am distinctly of opinion that strychnine shortens the period of analgesia; for this reason I have not thought it worth administering in my later cases. In Case 65 the analgesia rose as high as the third cervical nerve.

There is no objection, so far as can be seen, to the administration of any general anaesthetic in combination with spinal analgesia, and in no case of my own, nor, so far as I am aware, in that of any other surgeon, has an accident occurred as the result of such combination. Clearly, however, if a patient is analgesic to his clavicles, in most cases his intercostal respiration is in abeyance, and it is open to question how far it is safe to allow him to depend on his diaphragm alone. It would not be wise in the case of stout, heavy men, nor in elderly subjects with obvious osteo-arthritic changes in the thorax. Analgesia to the clavicles, however, is little likely to require the assistance of general anaesthesia.

It is noteworthy that if general anaesthesia is required, a very insignificant amount of chloroform or ether will suffice to abolish the discomfort to the patient, and as the abdominal walls are already under the influence of the spinal injection, there is no necessity for deep anaesthesia. One of the best testimonials to the efficacy of spinal analgesia in the abolition of shock is to be found in the statement by Tyrrell Gray in his article on this subject with regard to children,³ namely, that "with the exception of one case of resection and anastomosis, no case of intussusception has been lost under spinal anaesthesia, one case of appendicitis with practically general peritonitis has died on the eighth day, and only one case of pneumococcal peritonitis (other than pyaemic) has been lost up to the time of writing." This article, it must be remembered, covers a series of 200 cases of spinal analgesia in children.

The blockage of the particular afferent impulse which results in shock has been proved to be one of the most constant results of spinal analgesia, and to actuate over a period extending far beyond that in which mere pain is subdued. Thus, not only is immediate shock abolished, but that which is termed "delayed shock" is in most cases prevented. Should this latter complication make its appearance, however, it should be met by a second injection. The cases on my list to which I would especially draw attention as examples of severe or prolonged operations in which shock was entirely absent, and in which such absence would have been quite unusual had general anaesthesia alone been employed, are Nos. 3, 4, 6, 8, 9, 27, 31, 36, 50, 52, 55, 56, 57, and 59; the last four were especially remarkable, and I am convinced that these patients, with the exception of No. 56, are alive to-day as the direct result of the immunity to shock given by the method under discussion.

II. THE AVOIDANCE OR MINIMIZING OF THE DANGER OF CERTAIN COMPLICATIONS.

The greatest danger attending the prolonged handling of abdominal organs, next to that of shock, is that of *intestinal paresis*. If by any means in our power we can minimize this risk we ought certainly to adopt it, at least in those cases which from their nature suggest the probability of its occurrence after operation. Such are those of very large ventral hernias; those requiring extensive separation of adhesions; those involving the resection of unusual lengths of bowel; and those necessitating prolonged manipulation of the mesentery and structures in the portal fissure. Since ileus or peritoneal shock depends on transmitted peripheral nerve impulses in the splanchnic, just as general shock depends upon a similar condition in the systemic area, the cutting off of such impulses by the interposition of a temporary root paresis, such as that provided by spinal analgesia, must go far towards preventing the development of this dreaded phenomenon.

Again, it is obvious that where no general anaesthetic is given there is *no risk of bronchitis or pneumonia* due to this cause; and equally, where very little is required, such risk, if not entirely abolished, is at least greatly reduced. It is thus possible to submit safely to operation patients

who would under general anaesthesia run a very serious risk; for even when such anaesthesia is required to supplement spinal analgesia it is only administered for a short period, in very small quantities, and is never pushed to such a stage as would interfere with conjunctival or laryngeal reflexes. *Thus the average period of anaesthesia for the 18 cases in which it was used was fourteen minutes; the longest administration forty, and the shortest three minutes.* The immediate result of this combined method is the speedy return of the patient to his normal state of bodily comfort, as compared to the marked depression, anorexia, and nausea so frequently met with after prolonged anaesthesia. Feeding can be proceeded with at once, stimulants can be given, and the burden of nursing is materially reduced.

Similarly, patients whose cardiac condition would be an absolute bar to their undergoing any prolonged operation under general anaesthesia can be dealt with, frequently by spinal analgesia alone, always by the combined method, with a degree of safety which fully warrants their being submitted to such operation; such are cases of aortic aneurysm, double aortic and mitral disease, fatty degeneration of the heart, etc. The latter is perhaps the least favourable condition, since quite apart from the danger of anaesthesia, its victims do not react well after any operation, and in them the mortality of any extended procedure is always rather high. Thus, I have seen patients, both in my own practice and in that of other surgeons, come through their operation apparently in perfect safety, only to die at the end of five or ten days (note Cases 50 and 56), nothing being found at the autopsy to account for their deaths save extensive fatty infiltration of the heart. It must be understood that these are cases in which the burden of life has become sufficiently heavy to justify us in putting the victims to so considerable a risk. The mortality *must* always be high, but the number of cures in such cases is ample justification for entertaining hopes of a less tragic sequel. And here I would again state most emphatically that *stovaine*, the drug I have almost constantly employed, is *not* a cardiac depressant. Its action is probably to a slight extent vaso-dilator, but its influence in this direction is very brief and very limited, and it will be found that a patient who enters the operating theatre with a pulse of 140 will soon after injection be found to have a frequency of only 80 or 90, the beats being strong and regular (Cases 31 and 52).

Where spinal analgesia is used alone, post-operative vomiting is of the rarest occurrence, and when present is even more rarely anything but a simple regurgitation. The same holds good for the combined method; possibly sickness may be slightly more frequent, but in my own experience it has been quite rare after the combined method as compared with its almost constant and often violent and prolonged occurrence after general anaesthesia alone. This is a point which I think ought to appeal to the more progressive surgeon, since the strain on sutures and the consequent risk of post-operative hernia is greatly diminished; the dryness of the wound lessens the risk of infection, a matter of importance where the operation concerns the implantation of large silver filigrees, and the patient starts convalescence free from the exhaustion and starvation which so greatly prejudice his chances. Further, the quietness of the circulation and the absence of straining greatly diminishes the chance of persistent oozing into such cavities as the bladder, stomach, or bowel.

III. THE EASE OF OPERATING IS GREATLY INCREASED.

As has been pointed out by many writers, the abdomen under the influence of spinal analgesia presents a very different aspect to that which it exhibits under general anaesthesia, so far as the surgeon is concerned. It is flaccid, quiet, undisturbed by the involuntary efforts of straining and forced respiration which are often unavoidable in certain cases of general anaesthesia. Its walls are easily drawn aside without the disconcerting rush of intestinal coils so often seen in these cases, and especially so when the incision, as in cases of gigantic ventral hernia, at times reaches almost from the ensiform cartilage to the pubes. For the same reason these walls are easily approxi-

mated afterwards without the troublesome tendency of sutures to cut out through peritoneum, muscle, and fascia. In cases of intestinal or gastric perforation, appendicular abscess, pyosalpinx, etc., the ease with which the intestinal coils can be examined is of the greatest advantage, and saves the patient much unnecessary danger.

The immediate result of these advantages is that many abdominal sections can be performed in two-thirds of the time usually required under general anaesthesia.

IV. THE ADVANTAGE OF RETAINED CONSCIOUSNESS.

A point to which I have elsewhere drawn attention is the importance of being able to obtain from the patient on the spot permission to proceed to any special modification of the originally intended limits of the operation. Thus, for instance, the necessity may be found on opening the abdomen for the removal of both ovaries where only one was believed to be diseased, or possibly even a panhysterectomy may be required to which the patient had not previously given her consent. Such extension of operation under general anaesthesia when permission cannot be obtained has already been proved to be an extremely risky proceeding, and would now necessitate the closing of the abdomen, the obtaining of such permission, and the performance of a second operation.

Under this heading also may be put the advantage to the patient who has undergone a really serious operation of emergency. If seriously ill and in danger of death, he may still be in a position to sign a deed or leave directions to his friends, a thing which might be impossible had a general anaesthetic been used.

V. THE FACT THAT IT IS POSSIBLE TO COMPLETE MANY ABDOMINAL SECTIONS UNDER SPINAL ANALGESIA ALONE.

As will be seen from the cases which form the subject of this paper, the partial failure of spinal analgesia to control unaided the sensibility of the splanchnic area is no good reason for refusing to acknowledge its possibilities. In the majority of cases it is possible to complete an operation by its means alone with entire satisfaction to both patient and surgeon. Of the cases here reported (65), no less than 47, a proportion of 72.3 per cent., were done entirely under spinal analgesia, while, as already stated, in the remaining 18 the average duration of general anaesthesia administration was fourteen minutes, the longest administration—namely, forty minutes—being incidental to an operation of two hours' duration. The mere fact that, as in this latter case, a weakly and elderly patient may be saved the ordeal of a general anaesthesia lasting two hours, by substituting for it a very light administration of forty minutes, is a gain that the most confirmed supporter of general anaesthesia can hardly deny.

From considerations of space, I have been compelled to report the cases as briefly as possible; they are, however, consecutive, and, to the best of my belief accurate in all details. The temperature and pulse-rate given at the end of each case represent the highest readings in the five days immediately following operation; in this way I have avoided the possibility of a record of "delayed" shock being overlooked. It must be remembered that a rise of temperature is almost invariable for forty-eight hours to four days after *stovaine* injections, the average being about seventy-two hours, and the usual reading ranging from 100.2° to 98.8°.

In most of the cases in which a pulse-rate is recorded which would seem to indicate the occurrence of post-operative shock, it must be stated that other causes were present to account for such pulse-rate; thus, in Case 6 the patient was at the time of operation suffering from shock, and was extremely ill; the immediate result of his injection was a fall in the pulse-rate from 150 to 144, and subsequently to 110. In Case 13 there was, so far as could be seen, nothing to account for the pulse-rate of 136. As the patient had an unduly rapid pulse all the time she was in hospital, and yet appeared to be in perfect health, it was presumably physiological in her case.

Case 14 was again that of a patient who was *in extremis*, her operation being done hastily as a forlorn hope. The pulse of 116 in No. 17 was recorded on the fifth day, and probably indicated the occurrence of deep suppuration, as his umbilical and inguinal wounds subsequently discharged; he was an

* I have twice had all the deep stitches burst at the end of an operation under general anaesthesia. In one the accident occurred on the table, and was dealt with; in the other a recurrence of the hernia resulted in six weeks, the stitches having been ruptured three days after operation, vomiting having lasted for five days.

obese and plethoric subject and in poor health at the time of operation. The sweating recorded in his case was nothing more than that which is occasionally seen for a short period on the table about ten minutes after injection; it was not due to shock, as will be seen from the pulse-rate recorded with it.

In Case 19 the pulse-rate of 120 was due to distension of the bowels three days after operation, and was relieved by the rectal tube. In Case 27 the rate was a decreasing and not an increasing one, the reading before operation being 140, the patient being very ill. In Case 30 the pulse-rate was little affected by the operation, the patient being emaciated and feeble at the time. No. 32 at the time this reading was taken (namely, third day), owing to the circumstances of the operation, had a drainage tube in the abdomen; before this it had always been under 100. No. 35 resembled No. 13 in the fact that he appeared to be in perfect health in spite of his pulse-rate of 124. No. 42 was another case of a patient in a very grave state with rapid pulse before operation; as this rate fell from 130 to 110 after injection, his shock was distinctly lessened for the time being. So completely devoid was No. 50 of anything like shock after operation that I already congratulated myself on her recovery. Her condition altered so rapidly before death that it was clear that her pulse-rate of 120 was due to commencing cardiac failure and not to delayed shock. In No. 55 the patient was intensely septic, and his recovery I attribute almost entirely to the employment of spinal analgesia, his shock being markedly decreased by his injection. No. 56 closely resembled No. 50. Both were enormously stout patients with fatty hearts; both came through very severe operations without a sign of shock; both died as the result of cardiac failure, and in both the pulse ran up shortly before death.

In all there were 8 deaths, and the question arises. Could any of these be attributed to the effects of spinal analgesia? The analysis shows the following points:

Analysis of Deaths.

Operation.	No. of Cases.	Lived after Operation.	Spinal Symptoms.	Shock.	Post-mortem Findings.
Ventral hernia	1	48 hours	Nil	Nil	Cardiac failure: fatty heart and liver.*
Umbilical hernia	1	6 days	Nil	Nil	Cardiac failure: advanced fatty degeneration of all organs.*
Enterostomies..	3	4 hours 10 " 4 days	Nil " "	Nil " "	Cardiac failure. Sloughing gall bladder.* Cardiac failure.
Gastrostomy	1	36 hours	Nil	Nil	Cardiac failure.
Gangrenous appendix	1	4 days	Nil	Nil	Pulmonary embolism.
Oöphorectomy..	1	10 days	Nil	Nil	Uræmia; calculous anuria.

* In these cases only was it possible to examine the spinal meninges and cord; in all of them they were normal.

It will thus be seen that none of the deaths recorded were in any way connected with the method in question, while such cases as Nos. 26, 27, 38, 55, 57, and 58 serve to prove the value of spinal analgesia in some of the severest cases in surgery. It is interesting to note, in view of certain Continental reports, that the only case which showed any trace of albuminuria after injection was No. 49, and she had albumen in her urine before operation.

In conclusion, the results in these cases are, I think, sufficiently encouraging to warrant our attempting to utilize the method more frequently in abdominal surgery, combining it when necessary with general anaesthesia. It is not improbable that it may be found possible to replace even this general anaesthesia by injections of scopolamine and morphine in the near future, and so overcome the hypersensitiveness of the peritoneum and internal organs. If this proves to be the case, a very material advance will have been made in our methods of dealing with the abdomen and its contents. As regards

the method of injection, I would draw attention to the fact that in all of these cases, with the exception of Cases 8 and 9, the lateral position was used.

NOTES OF CASES.

CASE 1.—*Complete Procidentia of the Uterus: Ventrifixation by Author's Method of Filigree Suspension.*¹

S. D., married, aged 47. Complete prolapse for thirteen years. Injection 6 cg. stovaine-glucose solution in third lumbar interspace. Analgesia to sixth dorsal. Some temporary discomfort on packing abdomen with gauze. Dragging on uterus caused no discomfort. Analgesia lasted eighty minutes. No after-effects other than pyrexia and slight headache. Patient expressed her satisfaction with method. Pulse 88, temperature 99.6°.

CASE 2.—*Appendicectomy.*

C. McD., male, aged 26. Injection 6 cg. in third lumbar interspace. Analgesia to fifth dorsal. Analgesia lasted forty minutes. Vomited twice after operation. No headache. Felt some dragging on bowel; chloroform three minutes towards end of operation. Patient stated afterwards only some discomfort, no pain. The case was uncomplicated and with but few adhesions. Pulse 80, temperature 99.2°.

CASE 3.—*Ventral Hernia (Gigantic): Implantation of 8-in. Filigree.*

E. P., married woman, aged 47, with a very large median ventral hernia containing caecum, appendix, 3 feet of small intestine and a large mass of omentum. Injection 6 cg. in second lumbar interspace: analgesia to third dorsal; adhesions very dense; much time occupied in detachment. Duration of analgesia seventy-five minutes—hardly sufficient to complete operation. Patient complained of dragging on bowel. Chloroform given for ten minutes. No symptoms on table; slight headache afterwards. Two pounds' weight of omentum removed and an 8-in. filigree implanted. Convalescence uninterrupted. Pulse 96, temperature 100°.

CASE 4.—*Total Hysterectomy for Uterine Fibroids.*

A. B., unmarried woman, aged 48; a hospital nurse. Patient at her own request was submitted to operation under spinal analgesia. Injection 7 cg. in dorsi-lumbar interspace. Analgesia to fourth dorsal. Incision from midway between ensiform and umbilicus to pubes. Operation required much gauze packing and manipulation of organs. Patient exhibited no symptoms on table, felt nothing at all of operation, nor did her pulse-rate vary ten beats throughout. Analgesia lasted ninety minutes. Uterus and tumour weighed 8 lb. Patient made an excellent recovery. Pulse 82, temperature 100°.

CASE 5.—*Appendicectomy.*

A. S., male, aged 19. Injection, 6 cg. in third lumbar interspace. Analgesia to eighth dorsal. Did not last well; although operation lasted only thirty minutes, patient began to feel dragging on caecum and appendix at end of twenty minutes. Appendix found sloughing, but no perforation. Chloroform given for five minutes. No after-effects other than two days' pyrexia. Convalescence uninterrupted. Pulse 84, temperature 101.2°.

CASE 6.—*Enterostomy for Paralytic Ileus.*

J. P., male, aged 32. Patient was extremely ill, having recently recovered from the effects of an acute osteo-mylitis, and having the week previously been operated upon for biliary obstruction due to chronic pancreatitis, a cholecystenterostomy being performed. Ileus developed with faecal vomiting. Pulse 150. Injection 6 cg. in third lumbar interspace. Analgesia to fourth dorsal. Ileum opened in last 10 in. Condition on table good, no pain or discomfort; pulse fell from 150 to 144. After-condition good; vomiting ceased, bowels recovered, but patient died ten days later from sloughing of the gall bladder. Autopsy showed perforation of anterior wall of organ; anastomosis sound; general peritonitis commencing; cord and meninges normal. There is little doubt that this patient would have died on the table under a general anaesthetic, so extremely exhausted was he. Pulse 144, temperature 101°.

CASE 7.—*Ventrifixation of the Uterus by Filigree Suspension for Complete Procidentia (Author's Method).*

B. W., married, aged 37, had suffered from complete procidentia for some years. Injection 7 cg. in third lumbar interspace. Analgesia to sixth dorsal. Patient complained of nothing till uterus pulled up to abdominal wall, when some nausea and "pain in chest." As morphine did not affect this, chloroform was given for ten minutes. Abdomen remained flaccid, and intestines quiet throughout. No after-effects save pyrexia; patient made a good recovery. Pulse 100, temperature 100.6°.

N.B.—This patient has since been confined at full term without assistance.

CASE 8.—*Excision of Caecum, Appendix, and Four Inches of Ileum for Myxosarcoma.*

A. S., a male, aged 21. A pale, thin lad, who had had recurrent attacks of pain in the right iliac fossa without temperature, accompanied by vomiting. He looked very ill, and presented a firm mass in the region of the appendix. Injection 7 cg. in the second lumbar interspace in sitting posture. Analgesia to eighth costal cartilage. Abdomen opened to left of linea semilunaris; mass found involving structures named. Separation of adhesions gave rise to nausea and pectoralgia;

as this persisted, chloroform given for twenty-five minutes and the whole mass excised. A lateral anastomosis was performed by Murphy's button between the ileum and the ascending colon. Shock was entirely absent, although operation lasted nearly two hours, and patient made a good recovery. Pulse 80, temperature 100.4°.

CASE 9.—*Umbilical Hernia (Gigantic) and Implantation of 8-in. Filigree.*

S. C., a very stout woman aged 42, and weighing 18 stone. Has had a large umbilical hernia for many years. Injection, 6 cg. in dorsi-lumbar interspace in sitting position; difficult owing to lack of bony landmarks and great depth of fat. Analgesia to clavicles; patient was anxious owing to inability to cough. Diaphragmatic respiration, however, good, and a little oxygen served to make her quite comfortable. Operation conducted entirely under spinal anaesthesia without difficulty, an 8-in. filigree being implanted. Operation lasted ninety minutes, and the analgesia at the umbilicus 2.5 hours. No after-effects except pyrexia. Patient made a good recovery. Pulse 98, temperature 101°.

CASE 10.—*Ventrification of Uterus by Filigree Suspension (Author's Method).*

B. R., married, aged 65. Complete procidentia for seven years. Injection 6 cg. in third lumbar interspace. Analgesia to fourth dorsal. No pain nor discomfort on pulling on uterus. Operation lasted seventy minutes. No shock, sickness, nor headache. Patient said she felt nothing whatever of the operation. Good recovery. Pulse 100, temperature 100.3°.

CASE 11.—*Appendicectomy.*

B. R., male, aged 20. Fourteenth day of first attack. Injection 6 cg. in second lumbar interspace. Analgesia to eighth dorsal. No symptoms on table; patient comfortable. Incision internal to semilunar line; appendix found behind caecum, puffy and inflamed; few adhesions. Operation lasted thirty-five minutes; analgesia lasted ninety minutes. No after-effects; good recovery. Pulse 96, temperature 99.4°.

CASE 12.—*Ventrification of Uterus by Filigree Suspension (Author's Method).*

J. D., unmarried, aged 50. Sent to me by Dr. Boyd Robson. Complete procidentia for twelve years. Injection 6 cg. Analgesia to eighth dorsal. Patient felt some dragging and was nauseated in middle of operation. Chloroform given for five minutes. Operation completed under spinal analgesia. No shock or other after-effect. Good recovery. Pulse 79, temperature 99.5°.

CASE 13.—*Ventrification of Uterus by Filigree Suspension (Author's Method).*

K. O., married, aged 34. Sent by Major Norrington, R.A.M.C. Complete procidentia five years. Injection 6 cg. in second lumbar interspace. Analgesia to sixth dorsal. Felt nothing till almost the end of operation, when she complained of nausea and pectoralgia. Operation completed under chloroform for five minutes. No after-effects save rapid pulse, which appears to be natural to her, and pyrexia. Patient stated that she was very pleased with the method (she has had general anaesthesia before), and made a very good recovery. Pulse 136, temperature 100.8°.

CASE 14.—*Caecostomy for Acute Intestinal Obstruction.*

H. W., male, aged 49. Brought into hospital almost moribund, with history of faecal vomiting for three days. No cause of obstruction discovered. Injection 6 cg., in second lumbar interspace. Analgesia rose to fourth dorsal, when vomiting ceased. Caecum brought out and opened. Nothing felt of operation, and patient said he was much more comfortable after injection made. Pulse, which was running at 140, came down to 110. Patient, however, died four hours later, and was found at autopsy to have a malignant stenosis of the first part of the rectum.

CASE 15.—*Appendicectomy.*

C. B., male, aged 18. Recurrent attacks of pain for five months. Injection 6 cg. in second lumbar interspace. Analgesia to second dorsal. Slight retching, some diaphoresis, and pallor ten minutes later. Soon cleared up, and patient was perfectly comfortable, although towards end of operation analgesia was found to have extended to seventh cervical area; the intercostals were not notably affected. Appendix removed. No after-effects. Good recovery. Case uncomplicated by adhesions. Pulse 114, temperature 100.4°.

CASE 16.—*Ventral (Appendicular) Hernia: Implantation of 5-in. Filigree.*

F. A., male, aged 18. Operated upon in Chatham in 1907 for suppurating appendix; wound drained; recurrent abscess in 1908 in scar, again operated upon. Now marked bulging through both operation sites. Injection 6 cg. in second lumbar interspace. Analgesia to eighth dorsal. Many adhesions; operation very difficult. Some discomfort on separating ileum from sac, but not sufficient to necessitate chloroform. No toxic signs on table or after operation except pyrexia. Patient made an excellent recovery. Pulse 90, temperature 100.6°.

CASE 17.—*Umbilical Hernia: Implantation of 7-in. Filigree.*

G. D., male, aged 41. Has had umbilical and inguinal hernias since birth. Injection 6 cg. in second lumbar interspace. Analgesia, to second dorsal. On separation of adhesions patient complained of "pain in chest," and sweated

profusely. Pulse 82. Chloroform given for twenty minutes. Sigmoid found adherent to sac; adhesions separated, and a 7-in. filigree implanted. Operation completed under spinal analgesia alone. No after-effects. This wound subsequently broke down, and part of the filigree had to be removed, a second filigree being implanted at a later date. Pulse 116, temperature 100.4°.

CASE 18.—*Appendicectomy.*

H. N., male, aged 18. Second attack of appendicitis; operation on tenth day. Injection 6 cg. in third lumbar interspace. Analgesia to sixth dorsal. Appendix removed through separation in muscles. Patient felt nothing of operation, and exhibited no toxic signs on table. Good recovery. Pulse 79, temperature 99.9°.

CASE 19.—*Reposition of Caecum after Caecostomy.*

J. T., male, aged 40. Patient had had caecostomy done for ileus following a gastro-enterostomy. Injection 6 cg. in third lumbar interspace. Analgesia to sixth dorsal. Caecum detached, wound invaginated by three rows Lambert sutures, and bowel returned to abdomen; wound packed with gauze. No symptoms of any kind on table or after operation, except some distension which accounted for his pulse-rate. Good recovery. Pulse 126, temperature 99.2°.

N.B.—This patient again came to operation for hernia of his scar (see Case 24).

CASE 20.—*Appendicectomy.*

F. B., male, aged 18. First attack, tenth day. Injection 6 cg. in second lumbar interspace. Analgesia to ninth dorsal. Appendix removed with some difficulty owing to intimate adhesion to caecum. No symptoms on table and operation was devoid of pain, but an hour after injection analgesia was found to have mounted to second dorsal, and patient was rather cyanosed and retched once or twice. This I attribute to the carelessness of the porters, who took him upstairs feet first and in their ignorance handled him rather roughly. He was the only case on the list that had to be taken upstairs. Made a good recovery. Pulse 84, temperature 99.8°.

CASE 21.—*Ventral (Appendicular) Hernia: Implantation of 7-in. Filigree: Appendicectomy.*

L. L., male, aged 30, sent me by Dr. M. J. Longinotto. Had had an appendicular abscess nine months previously; operation was done, but appendix not removed. Sinus persisted, and from it a calculus was ejected six months later; healing followed by hernia. Injection 6 cg. in second lumbar interspace. Analgesia to fourth dorsal. Old cicatrix and sac removed; appendix found very adherent behind caecum, and removed. Peritoneum repaired and 7-in. filigree implanted. Patient felt nothing of operation, in spite of much pulling on the bowels. Slight headache, yielding to aspirin, after operation. Excellent recovery. Pulse 76, temperature 99.4°.

CASE 22.—*Ventrification of Uterus by Filigree Suspension (Author's Method).*

L. D., married woman, aged 27. Complete procidentia for over two years following confinement. Injection, 6 cg., in third lumbar interspace. Analgesia to fourth dorsal. Intestines packed back, uterus withdrawn, filigree implanted in anterior wall of uterus, floor of pelvis, and abdominal wall as high as umbilicus. Patient was slightly nauseated for a few minutes at commencement of operation, after which she was perfectly comfortable; no sickness. Operation lasted seventy minutes and analgesia at umbilicus ninety-five minutes. No after-effects other than pyrexia. Good recovery. Pulse 96, temperature 100°.

CASE 23.—*Appendicectomy.*

W. P., male, aged 21. First attack; operation on seventh day. Injection 6 cg. in second lumbar interspace; analgesia imperfect, rising only to twelfth dorsal. Second injection given 4 cg. in same space; analgesia to ninth dorsal, but not very deep, as patient from time to time complained of sensations of dragging; he, however, would not have a general anaesthetic. Appendix found acutely kinked and inflamed; removed. No after-effects. Convalescence normal. Pulse 76, temperature 100°.

CASE 24.—*Ventral (Appendicular) Hernia: Implantation of 6-in. Filigree.*

J. T., male, aged 40. Hernia resulting from reposition of caecum (see Case 19) after caecostomy. Injection 6 cg. in dorsi-lumbar interspace; analgesia to fourth dorsal. Cicatrix excised and appendix removed.* Filigree implanted after extensive separation of adhesions. No difficulty encountered; patient remained perfectly comfortable, and, having twice before had chloroform, volunteered statement that he much preferred spinal analgesia. No after-effects. Convalescence normal. Pulse 88, temperature 98.4°.

CASE 25.—*Epigastric Hernia.*

J. C., male, aged 35. Small hernia of spontaneous origin half-way between umbilicus and ensiform cartilage. Injection in this case after Jonnesco's formula: Stovaine (pure) 3 cg. + strychnine 1 mg., in the seventh dorsal interspace; head

* It is my invariable rule to remove the appendix before implanting a filigree here; if this is not done there is always the possibility of an appendicitis occurring where the appendix has not been removed at the time of its suppurating, in which case the filigree would be destroyed by operation.

and shoulders dependent; analgesia from eyes to groins, and very perfect. Sac excised and muscles approximated. No pain, nausea, nor sickness. Respiration quite uninterfered with. No after-effects other than pyrexia. Pulse 90, temperature 100.2°.

N.B.—This case subsequently recurred and was cured by filigree implantation.

CASE 26.—Perforated Duodenal Ulcer: Laparotomy.

H. L., male, aged 26. Admitted to hospital in a very feeble and desperate condition, having apparently suffered perforation sixteen hours previously. Injection after Jonnesco's formula: Stovaine (pure) 10 cg. + strychnine 1 mg., in dorsi-lumbar interspace; analgesia to second dorsal. Ulcer found on posterior aspect of the second part of duodenum and partially sealed off. Much pus among the intestinal coils and in the pelvis. Site of ulcer packed with gauze four days; abdomen swabbed out and drained through loin and pubes. Patient felt nothing of operation; no vomiting; condition on table, if anything, improved by injection. Operation lasted seventy minutes. Good recovery. Pulse 96, temperature 100.8°.

CASE 27.—Perforated Appendix: General Peritonitis: Laparotomy.

H. C., male, aged 32. In London Hospital two years ago for appendicitis; condition of kidneys at this time precluded operation. On admission had apparently perforated six hours previously. Looked extremely ill; typical facies Hippocratica; pulse 135. Injection 6 cg. in third lumbar interspace. Analgesia to eighth dorsal, and quite perfect. Pus and lymph in abdomen and pelvis; appendix found adherent to caecum, and perforation near base; removed; abdomen swabbed out; drainage through wound and above pubes. Patient felt nothing of operation and his condition was distinctly improved by the injection. Good recovery. Pulse 120, temperature 104°.

CASE 28.—Appendicectomy.

R. F., male, aged 25. Has had three attacks in the last twelve months, temperature ranging from 100° to 102.5°. Injection 6 cg. in third lumbar interspace; analgesia to seventh dorsal. Incision internal to semilunar line. Appendix very friable, with recent adhesions to omentum and old ones to caecum. Omentum ligated and removed. No toxic signs on table and no after-effects. Analgesia perfect. Pulse 89, temperature 102°. Good recovery.

CASE 29.—Oöphorectomy.

K. M., unmarried woman aged 36. A nervous, thin woman suffering for some years from right-sided ovarian pain. Injection after Jonnesco's formula: Stovaine (pure) 8 cg. + strychnine 1 mg., in dorsi-lumbar interspace; analgesia to fourth dorsal. No pain felt; no nausea; no after-effects. Right ovary and tube found bound to floor of pelvis by adhesions; removed. Good recovery. Pulse 82, temperature 99.8°.

CASE 30.—Gastrostomy for Carcinoma of Cardia.

C. R., male aged 60. Gradual wasting and inability to swallow solid food. This patient was sent into hospital much too late, and was only operated upon at the earnest request of his relatives. Injection after Jonnesco's formula: Stovaine (pure) 6 cg. + strychnine 1 mg., in second lumbar interspace. Analgesia to fourth dorsal, but imperfect. Patient complained of dragging as soon as the stomach was drawn out of abdomen. Chloroform given for twenty minutes. Witzel's gastrostomy done. Patient gradually sank and died thirty-six hours later. His pulse ran up to 120 shortly before death, although on the table it was never over 90.

CASE 31.—Oöphorectomy: Appendicectomy: Myomectomy.

B. C., a thin, nervous married woman of 43, sent me by Dr. Croft Watts, of Farnborough, suffering from a large abdominal tumour and pain in the region of the appendix. Before operation this patient's pulse was 130 from nervousness. Injection after Jonnesco's formula: Stovaine (pure) 6 cg. + strychnine 1 mg., in dorsi-lumbar interspace. Analgesia to fourth dorsal. As soon as abdomen opened, and patient informed that operation had been in progress some minutes, her pulse fell to 88, and never rose above this again. Right ovary size of a Rugby football and filled with old blood, found adherent to appendix, which was long and hyperplastic; there was also a fibroid of the uterus the size of a Jaffa orange projecting from the right side of that organ; this was enucleated, and the ovary and appendix were removed. Patient knew neither when the operation began nor when it finished. There was neither nausea, discomfort, sickness nor shock, and she made a rapid recovery. Pulse 98, temperature 100.4°.

CASE 32.—Gangrenous Appendicitis: Drainage.

G. H., male, aged 23. Admitted during his second attack. Disease appeared to be subsiding, but on tenth day his temperature rose suddenly and he had tenderness over the appendix. Injection 6 cg. in third lumbar interspace; analgesia to ninth dorsal. As soon as peritoneum opened an almond-shaped calculus was extruded into the wound, and appendix found to be intimately bound to caecum, ileum, and abdominal wall, and to be gangrenous at the tip, the whole site being intensely inflamed. Area cleansed and packed with gauze. Patient felt nothing of operation and was quite comfortable. No after-effects; temperature normal on third day. On the fourth his pulse ran to 100, and his temperature to 99.5°, and on the morning of the fifth day, while being placed on the bedpan, he

suddenly collapsed, his pulse being then 120, and he died almost at once. Autopsy showed large ante-mortem clot in pulmonary artery.

CASE 33.—Appendicectomy.

J. T., male, aged 20. Second attack. Operation on tenth day. Injection 6 cg. in second lumbar interspace; analgesia to tenth dorsal. Patient vomited once on manipulation, after which he was comfortable. Appendix adherent to caecum and abdominal wall; small concretion at base. Analgesia perfect after first five minutes. Appendix removed. No after-effects. Recovery normal. Pulse 100, temperature 101.4°.

CASE 34.—Ventrifiration (Simple).

G. G., unmarried woman, aged 40. A nervous woman but of good physique, sent me by Dr. J. M. Brydone. Has had prolapse of uterus of second degree for four years. Injection 6 cg. in third lumbar interspace; analgesia to eighth dorsal. Shortly after injection she became faint and sweated for about fifteen minutes. She also complained of pectoralgia when uterus drawn into wound. Chloroform was therefore given for fifteen minutes and operation completed under its influence. Her symptoms on table were, I think, largely nervous, and were never serious, nor did they cause any anxiety. No after-effects. Recovery normal. Pulse 78, temperature 99°.

CASE 35.—Appendicectomy.

H. G., male, aged 16. Has always had pain in right side of abdomen from time to time. Suffered from Raynaud's disease about four years ago, affecting his fingers, toes, and ears. This is his second definite attack of appendicitis. Injection 6 cg. in third lumbar interspace; analgesia to sixth dorsal. No toxic symptoms. Appendix found adherent and much lymph in vicinity; removed. No after-effects. Convalescence normal. There was nothing to account for his pulse-rate, his condition being excellent all the time. Pulse 124, temperature 99.4°.

CASE 36.—Ventral Hernia (Gigantic): Implantation of 9-in. Filigree.

J. H., a stout woman aged 50, with an enormous ventral hernia of some years' standing, for which she was sent to me by Dr. Fleming, of Hampstead. Injection after Jonnesco's formula: Stovaine (pure) 8 cg. + strychnine 1 mg., in second lumbar interspace; analgesia to third dorsal. The operation was difficult, owing to the density of the adhesions. Sac contained the entire omentum, transverse colon, and about 10 feet of small intestine. In spite of prolonged handling of the bowels, the operation, which lasted fifty minutes, was entirely devoid of discomfort, nausea, and shock. Pulse remained regular throughout. There were no after-effects. Patient developed facial erysipelas on the eighth day, but this cleared up rapidly. Good recovery. Pulse 76, temperature 98.6°.

CASE 37.—Ventral Hernia.

W. B., male, aged 62. Hernia followed a suprapubic prostatectomy done abroad some years previously, and was of the size of a Jaffa orange. Injection 6 cg. in third lumbar interspace; analgesia to eighth dorsal. Sac opened and adhesions of small intestine detached; bladder separated from margins of wound; simple approximation of recti muscles. Patient felt nothing of manipulation; no nausea; no after-effects. Convalescence normal. Pulse 76, temperature 97°.

CASE 38.—Panhyterectomy and Oöphorectomy.

This case was injected by me at the request of Mr. J. Bland-Sutton, who operated upon her, in order to avoid the danger of general anaesthesia. The following notes were kindly given me by Mr. Bland-Sutton: "The patient was a stout woman of 58 years of age, with a large calcified fibroid in the uterus and a big ovarian cyst extending high under the costal arch. Heart was pronounced to be in a state of fatty degeneration by a physician and an anaesthetist. Operation urgently necessary on account of the tumour embarrassing respiration. Administration of ether or chloroform considered to be attended with very grave risks. Intradural injection of stovaine. Operation easily completed. Patient ate her usual dinner six hours after the operation. Recovered quickly and easily. In excellent health eight months later." Injection 6 cg. in dorsi-lumbar interspace to one side of middle line owing to ossification of supraspinous ligament. Analgesia to second dorsal. No toxic symptoms. Patient said she "felt as if she were in a warm bath." The operation involved a very great deal of traction and severe manipulation of abdominal contents, but she felt nothing of it. Pulse 78, temperature 99.2°.

CASE 39.—Appendicectomy.

H. H., male, aged 42. Developed appendicitis whilst in medical wards for pneumonia. First attack. Operation tenth day. Injection 6 cg. in third lumbar interspace; analgesia to seventh dorsal. Appendix found behind caecum and adherent; removed through separation in muscles. No discomfort; no after-effects. Recovery normal. Pulse 70, temperature 99.2°.

CASE 40.—Ventral Hernia: Implantation of 7-in. Filigree.

M. H., unmarried woman, aged 45. This patient, sent to me by Dr. Forsyth of Southend, had been operated upon for appendicitis four years previously by another surgeon, and two years later by the same surgeon for an ovarian tumour, both of these operations being done through the same incision. A ventral hernia developed, and at time of operation the gap admitted the whole hand edgewise into the abdomen. Injection 6 cg. in

third lumbar interspace; analgesia to sixth dorsal. Patient felt nothing of the operation, which was an extensive one, till within five minutes of the end, when she complained a little of the upper sutures. It was not bad enough to induce her to have general anaesthesia, and the operation was completed in seventy minutes. A 7-in. filigree was implanted. No nausea on table nor any after-effect. Patient was very pleased with the method, and made an excellent recovery. Pulse 99, temperature 98.8°.

CASE 41.—*Exploratory Laparotomy.*

B. R., a married woman of 46. Admitted for swelling of abdomen, which had all the characteristics of pregnancy. She, however, had had nine children, and said she was positive she was not pregnant, having been regular to date, and having had no morning sickness or other signs. No fetal heart was heard nor movements felt. On the possible chance of finding an ovarian cyst, an operation was performed. Injection 6 cg. in second lumbar interspace; analgesia to sixth dorsal. Abdomen opened and explored; tumour was found to be a pregnant uterus at seventh month. Patient felt no discomfort, and was not nauseated. No after-effects, and patient made a rapid recovery. She was normally confined two months later; there was considerable hydramnios. Pulse 86, temperature 98.2°. There is no doubt but that had this case required it, a Caesarean section or a Porro's operation would have been quite painlessly performed.

CASE 42.—*Caecostomy for Acute Obstruction.*

C. M., male, aged 65. This patient was seen by me for Dr. E. C. Bridges of South Kensington, and was suffering from acute intestinal obstruction, the cause of which was uncertain. He was a prematurely aged man, and was extremely ill, with faeculent vomiting and rapid pulse and diaphoresis. A diagnosis of carcinoma of the sigmoid was the most probable, and operation was performed. Injection 6 cg. in dorsi-lumbar interspace; analgesia to sixth dorsal. Abdomen opened in middle line below umbilicus, but exploration failed to reveal the cause of the obstruction, the bowels being so tensely distended and the patient so ill that I did not consider anything extensive justifiable at the moment. Caecum brought out and opened, and a Paul's tube inserted. Considerable relief resulted from the injection, the pulse falling from 130 to 110. The bowels, however, never fully recovered their tone, only small quantities of flatus and motion passing, and patient died on the fourth day. No after-effects other than those due to his condition. No autopsy was allowed. This patient would almost certainly have died on the table under general anaesthesia, which in any case would have gravely increased his danger.

CASE 43.—*Ventral Hernia: Enterectomy; Entero-anastomosis: Implantation of 7-in. Filigree.*

I. B., married woman, aged 45. Suffering from a large ventral hernia of some years' duration, for which no less than five operations had been done in other hospitals. Injection 6 cg. in dorsi-lumbar interspace; analgesia to fifth dorsal. Adhesions of ileum and omentum to sac were very dense and required prolonged dissection to remove latter. A stenosis of the ileum was found which required resection of about 2 in.; an end-to-end anastomosis by direct suture was performed, and a 7-in. filigree was implanted on the posterior lamella of the rectus sheath. Patient became nauseated during the anastomosis and complained of pectoralgia; chloroform given for about fifteen minutes. Operation completed under spinal analgesia alone. No after-effects, and patient made an excellent recovery, in spite of the very severe handling of the bowels. Pulse 80, temperature 99°.

CASE 44.—*Appendicectomy.*

G. G. Recurrent appendicitis for past six months. Injection 6 cg. in third lumbar interspace; analgesia to sixth dorsal. Simple appendicectomy; no adhesions; patient felt nothing of operation; no after-symptoms. Good recovery. Pulse 80, temperature 100°.

CASE 45.—*Exploratory Laparotomy.*

P. C., male, aged 59. Chronic abdominal pain for ten weeks in region of pylorus; vomiting and diarrhoea, but no haematemesis. Injection 6 cg. in dorsi-lumbar interspace; analgesia to fourth dorsal. Patient became nauseated when stomach drawn into wound, and complained of pectoralgia, bringing up quantities of wind. Stomach and pylorus were normal. Chloroform given for ten minutes. A well-marked pocket was found to the left of the oesophageal opening in the diaphragm, but there was no bowel in it. Nothing else was found to account for his trouble. No after-effects, except that he developed femoral thrombosis a week later, first in one and then in the other leg. This ultimately cleared up. Pulse 94, temperature 100.2°. Good recovery.

CASE 46.—*Appendicectomy.*

S. G., male, aged 24. First attack; operation tenth day. Injection 6 cg. in third lumbar interspace; analgesia to seventh dorsal. Appendix found adherent to caecum and acutely inflamed; separation difficult on account of old adhesions, in spite of patient's statement as to first attack. No symptoms on table or after operation. Good recovery. Pulse 92, temperature 99°.

CASE 47.

M. J., unmarried woman, aged 25, sent me by Dr. J. M. Brydone. Has had one or two attacks of appendicitis. Injection 6 cg. in third lumbar interspace; analgesia to seventh dorsal. Incision internal to semilunar line; appendix found adherent in pelvis. During manipulation patient became nervous, but not nauseated, nor did she complain of discomfort. Chloroform was given for three minutes, but this patient objected strongly to and refused to continue with. Operation completed under spinal analgesia alone. Patient felt nothing, and had no after-effects. Good recovery. Pulse 76, temperature 99.2°.

CASE 48.—*Appendicectomy.*

S. N., married woman, aged 38. Has had five attacks of appendicitis, and is the subject of well-marked locomotor ataxy. Injection 6 cg. in second lumbar interspace; analgesia to fourth dorsal. Incision internal to semilunar line; appendix adherent and requiring much separation and handling of bowel; removed. Patient felt nothing of operation, which lasted forty minutes. Slight headache, which yielded to aspirin after operation. No alteration in her spinal symptoms as result of injection up to time of writing (seven months). Good recovery. Pulse 74, temperature 100°.

CASE 49.—*Oöphorectomy.*

F. O., unmarried woman, aged 25. Admitted for a solid tumour of right ovary. Patient looked ill and wasted, but there was no sign of any other trouble, except a slight cloud of albumen in her urine, which was thought to be due to pressure of the tumour on her ureters, and a temperature of 101° and pulse of 94, which seemed to point to suppuration in the tumour. Injection 6 cg. in dorsi-lumbar interspace; analgesia to fourth dorsal. Tumour found to be right ovary, the size of a Rugby football, with many recent adhesions of the ileum to its upper pole and some slightly turbid fluid in abdomen. Removed and abdomen swabbed out; weighed 15 lb. Patient was comfortable throughout operation, which lasted forty-five minutes. Tumour on incision contained grumous-looking fluid at upper part, remainder being pure fibroma. On eighth day patient ceased to pass urine, her pulse being 110 and her temperature 101°. On the ninth she became convulsed and finally comatose, and she died on the tenth day after operation. The autopsy revealed large calculi in both kidneys; no pus in either pelvis, but acute inflammation of parenchyma. She had never had renal colic or any other sign of calculus, save the albumen mentioned.

CASE 50.—*Ventral Hernia (Gigantic): Implantation of 10-in. Filigree.*

M. C., an unmarried "woman," aged 47. This patient was the victim of the largest ventral hernia I have ever seen. She weighed 19 stone, and was in such discomfort that she was entirely incapacitated from any active work. Rather against my advice she begged that something might be done, although the grave risk of such an operation was fully explained to her and to her relatives. A specially long needle had to be constructed to reach her theca. Injection 6 cg. in dorsi-lumbar interspace; analgesia to second dorsal. Patient was perfectly comfortable, without nausea or discomfort through a long (two hours and a half) and very trying operation. Sac contained about 10 ft. of small intestine, the entire omentum, transverse colon and sigmoid. With great difficulty all the bowel was returned, the omentum being removed, and a 10-in. filigree (the largest I have ever used) was implanted. Patient was not in the least upset by operation; pulse 85. All went well till second day, when her pulse ran up to 120 without any evidence of shock, and she became cyanosed and died suddenly. Autopsy revealed, as expected, advanced fatty degeneration of the heart and organs. No other lesion present. Patient was a well marked male hermaphrodite; no uterus or ovaries; well developed testis in left inguinal canal with patent vas deferens; clitoris size of penis of a boy of 15, and rudimentary vagina, into upper part of which urethra opened.

CASE 51.—*Appendicectomy.*

M. C., unmarried girl of 25. First attack. Operation, tenth day. Injection 6 cg. in third lumbar interspace. Uncomplicated case. No nausea; some discomfort in middle of operation. Chloroform given for twelve minutes. Appendix removed. No after-effects other than pyrexia. Pulse 78, temperature 101°. Good recovery.

CASE 52.—*Ventral Hernia: Implantation of 8-in. Filigree.*

M. de B., married woman, aged 43, sent to me by Dr. Beer, of Hampstead, for a large ventral hernia, following two laparotomies done elsewhere. Injection 6 cg. in dorsi-lumbar interspace; analgesia to third dorsal. Sac excised, contents returned, and 8-in. filigree implanted. Patient felt nothing of operation till adhesions nearly separated, when she complained of nausea and pectoralgia; chloroform given for fifteen minutes. Operation completed under stavaine alone, patient being fully conscious for last twenty minutes. Case very difficult owing to density of adhesions, which involved stomach, omentum, transverse colon, and small intestine. Pulse never altered on table, remaining below 90, although before operation it was 120 to 130. Operation lasted two hours. In this case only had the patient any real headache; it was severe and lasted four days. This is the only case I have come across in which aspirin failed to relieve. She told me, however, that she had had just the same trouble after each of her other operations done under general anaesthesia. No other after-effects. Excellent recovery. Pulse 80, temperature 101.2°.

CASE 53.—Ventral Hernia (Appendicular) following Appendicectomy: Implantation of 6-in. Filigree.

L. A. D., male, aged 32. Patient was sent to me by Fleet Surgeon Macnamara, R.N. Was operated upon six years ago for appendicitis after second attack. Bulging of scar for 5.5 years. Scar admits four fingers easily into abdomen. Injection 6 cg. in second lumbar interspace; analgesia to ninth dorsal. Difficulty in getting drug to rise owing to there being no table admitting of Trendelenburg position. Scar excised, and small intestine found densely adherent to upper angle of the incision. Separation difficult and prolonged; patient began to feel some pain, and as much remained to do at this spot chloroform was given for eight minutes. Detachment effected and filigree inserted. Remainder of operation done under stovaine alone, patient being fully conscious. Pulse remained below 80 throughout in spite of severe handling. No after-effects. Excellent recovery. Pulse 80, temperature 99°.

CASE 54.—Appendicectomy.

E. S., male, aged 28. First attack; operation on tenth day. Injection 6 cg. in second lumbar interspace; analgesia to seventh dorsal. Uncomplicated case; appendix found in pelvis not adherent; removed. No discomfort on table or after operation. Normal recovery. Pulse 80, temperature 99.2°.

CASE 55.—Perforated Appendix: General Peritonitis.

R. S., male, aged 37. Admitted looking very ill; facies Hippocratica; rigidity of right side of abdomen, vomiting, and tenderness. Pulse 110, temperature 101°. Tongue moist, but furred. Had apparently perforated about six hours. Refused operation at 4 p.m., but consented at 8.30 p.m.; condition then much worse. Pulse 130. Distended; tongue dry and brown. Injection 6 cg. in second lumbar interspace; analgesia to seventh dorsal. Pus and gas in abdomen among coils and in pelvis in quantity. Appendix gangrenous and perforated at base. Swabbing out caused some nausea and discomfort, so chloroform was given for ten minutes. Appendix removed, abdomen drained through wound and over pubes. Completed under stovaine alone. Patient's shock was markedly decreased after injection, pulse dropping from 130 to 108. Case was intensely septic, and convalescence was slow. Ultimate recovery excellent. Pulse 114, temperature 101.2°.

CASE 56.—Umbilical Hernia: Implantation of 6-in. Filigree.

H. C., male, aged 50. This patient was very stout and plethoric, and had had a litholapaxy done some years previously. Chronic cystitis ever since. I had performed a double-filigree implantation upon him three weeks previously under spinal analgesia, for inguinal hernia of large dimensions. The risk of present operation was inconsiderable compared with the latter, which was difficult and extensive. Injection 6 cg. in dorsi-lumbar interspace; analgesia to sixth dorsal. Operation was simple, and only took twenty-five minutes, a 6-in. filigree being implanted. Patient felt nothing of it, and was comfortable throughout. Patient did well till fifth day, when he commenced to vomit small quantities of dark-coloured fluid from time to time; bowels open every day; no tenderness nor distension; he became cyanosed the following day, and it was clear that his heart was failing; on the seventh day from operation he died suddenly. Autopsy showed advanced fatty degeneration of heart and organs. No other lesion except chronic cystitis above mentioned. Kidneys healthy. Wound sound; filigree incorporated. Pulse 87, temperature 100.8°.

CASE 57.—Carcinoma of Rectum: Ligation of both Internal Iliac Arteries: Abdomino-perineal Excision: Transverse Colotomy.

M. W., unmarried woman, aged 67, sent to me by Dr. Donkin of Bexley for bleeding from rectum and constipation. Growth found in second part of rectum; cauliflower epithelioma with glands in sacral chain enlarged; not fixed and not very vascular. Injection 6 cg. in dorsi-lumbar interspace; analgesia to third dorsal. Patient, who was a thin, delicate-looking woman, fully understood the nature of what was proposed, and said she would tell me if she wished to have chloroform. A transverse colotomy was first of all performed through an incision to the left of the middle line, the bowel being left on a rod. Abdomen opened below umbilicus; intestines packed off; both internal iliac arteries tied; sigmoid isolated, double-ligated, and divided. At this point patient became nervous and asked for chloroform, which was administered by Dr. Maynard Horne for about forty minutes. Ends of sigmoid invaginated; rectum and glands stripped from sacrum; abdomen closed; direct excision of detached bowel now performed in lithotomy position. All of this latter was performed under spinal analgesia alone, the patient being fully conscious, as the chloroform administration had been very light. Operation lasted two hours, during which pulse was excellent, and she had no nausea on table or afterwards. Next day patient told me she "had nothing she could call pain, but her nerve failed her." No after-effects; recovery excellent. Pulse 98, temperature 99.8°. This patient was so fragile that I would never have attempted so severe an operation under general anaesthesia in her case.

CASE 58.—Appendicectomy.

G. C., male, aged 50. First attack; operation on tenth day. Case was uncomplicated. Injection 6 cg. in second lumbar interspace; analgesia to fourth dorsal. Appendix found long and slightly engorged; complete stenosis at last inch of its length; no adhesions. Removed through separation in muscles. Patient comfortable; no nausea; no after-effects; good recovery. Pulse 80, temperature 99.8°.

CASE 59.—Strangulated Inguinal Hernia: Enterectomy: Entero-anastomosis.

J. L., male, aged 54. This patient was under the care of and was operated upon by Mr. Gwynne Williams in my absence. He was admitted in a very feeble condition with faecal vomiting due to a strangulation of intestine in a hernial sac of large dimensions. Strangulation for over forty-eight hours; pulse 120. Injection 6 cg. in second lumbar interspace; analgesia to sixth dorsal. On opening the sac, 10 in. of gangrenous bowel found; inside the abdomen and fixed to the pelvis was a second coil of bowel strangulated by the first, and also gangrenous; these two portions, including the intervening section, totalled a length of over 7 ft.; a single resection of the whole was performed and an end-to-end anastomosis by direct suture was done; mesentery overlaid and fixed down to the iliac fossa. A faecal fistula developed, but closed after a short time, and patient was discharged well. Operation lasted ninety minutes, and patient felt nothing of it; no shock nor any after-effects other than pyrexia. Pulse 100, temperature 100°.

I have included this case, although it was an inguinal hernia, because from the very great length of intestine removed and from the pelvic connexions of the gangrenous portion, it was really of the nature of a laparotomy, and because of the very serious condition of the patient on admission. It was in the highest degree improbable that he would have left the operating table alive had the operation been done under general anaesthesia.

CASE 60.—Exploratory Laparotomy.

E. G., male, aged 48. Aching pain in right iliac fossa for a month, vomiting, retching, constipation. Tumour in iliac fossa, tenderness and rigidity. Patient had been explored a week previously under spinal analgesia through an incision over appendix, when density of mass forbade any further attempt by this route—a portion had been removed and proved to be carcinomatous. Injection 6 cg. in dorsi-lumbar interspace; analgesia to eighth dorsal. This injection was given with a view to diminishing shock rather than to replace general anaesthesia; chloroform was therefore given at once. Median incision; tumour found to involve caecum, ascending colon, and a large coil of small intestine. After an attempt, lasting twenty minutes, to separate the mass, operation was abandoned as impossible and abdomen was closed. Patient was never under influence of chloroform entirely, and was completely conscious during the closure of the abdomen. He felt nothing and suffered no shock on table or after operation. Temporary recovery good. Pulse 110, temperature 101.4°. Patient died eighteen months later from carcinoma of liver, etc.

CASE 61.—Appendicectomy.

P. F., male, aged 36. Admitted for pain, rigidity, and tumour in right iliac fossa. First attack; operation tenth day. Incision internal to semilunar line. Appendix found in a mass of omentum, perforated at tip, and adherent to caecum and lower end of ileum; some pus in omentum. Injection 6 cg. in second lumbar interspace; analgesia to fifth dorsal. Slight pectoralgia; not bad enough for chloroform. Appendix removed. No after-effects. Recovery normal. Pulse 98, temperature 100°.

CASE 62.—Ventral (Epigastric) Hernia.

J. L., male, aged 33. Ventral hernia all his life above umbilicus. Lately getting larger. Injection 6 cg. in third lumbar interspace; analgesia to second dorsal. Ten minutes after injection some nausea and vomiting, which soon passed off, after which comfortable. Sac removed; omentum ligated; rectus muscles turned out of sheath and approximated. Recovery normal. No after-effects, except pyrexia. Pulse 88, temperature 100°.

CASE 63.—Gastro-enterostomy: Duodenal Ulcer.

J. N., male, aged 44. Pain, vomiting, and melaena for five months. Injection 6.5 cg. in dorsi-lumbar interspace; analgesia to third dorsal. Some nausea lasting five minutes; no vomiting; patient declared himself quite comfortable. Abdomen opened and duodenum explored; ulcer found in first part and adherent to liver. Stomach turned out and posterior gastro-enterostomy performed. Operation lasted forty-five minutes; patient felt nothing of it, and left table with a pulse of 80. Good recovery. Pulse 98, temperature 100°.

CASE 64.—Panhysterectomy: Fibroids and Double Pyosalpinx.

J. L., married woman, aged 45. Sent me by Dr. Hogarth, of Woolwich. Tumour growing in abdomen for four months; lately been very painful; slight metrorrhagia during the past fortnight. Injection 6.5 cg. in dorsi-lumbar interspace; analgesia to third dorsal. Patient rather nervous, with pulse of 130; became nauseated ten minutes after injection, and retched from time to time during operation; she however felt no pain, and in spite of her sickness refused chloroform twice when it was offered her. Many adhesions between uterus, ileum, and transverse colon, separation of which caused absolutely no pain, but started retching. Both Fallopian tubes distended and adherent. Uterus extensively fibromyomatous, and about the size of a child's head. Pulse at this time 100. Whole tumour removed, abdomen swabbed out, and closed. Operation lasted forty-five minutes. Patient's colour and pulse were excellent all the time, the former being 80 just at conclusion of operation. Pulse 86, temperature 100°. Convalescence normal.

CASE 65.—*Gastrostomy: Carcinoma of Oesophagus.*

W. D., male, aged 59. Patient, although unable to swallow solids, and very little fluid, was still in fair condition, but suffering a good deal of pain. Injection 6 cc. in dorsi-lumbar interspace. Owing to an error in arranging the table, the analgesia ran rather high and fairly rapidly, reaching the clavicles in three minutes. Patient became rather pallid, but his respiration remained good throughout; he complained of inability to cough, a sign I have noted in a few other cases of very high analgesia, where the intercostals have been affected. The pulse was also feeble for some minutes, but at no time did his condition cause anxiety. Analgesia at this time found to reach third cervical; diaphragmatic respiration good. A Senn's gastrostomy was easily and quite painlessly performed, retching only occurring on two occasions, when a mouthful of bile was ejected. Operation lasted twenty-five minutes, at the end of which a little oxygen was given for the patient's comfort, not because he was cyanosed. Fifteen minutes after returning to bed, analgesia had fallen to the fifth dorsal. No after-effects, except pyrexia. Pulse 87, temperature 99.8°. Convalescence normal.

N.B.—This case represents the highest analgesia I have ever obtained, with the exception of those cases done by Jonnesco's method.¹ It was unintentional, unnecessary, and should not have occurred. It, however, again serves to prove the immunity of the heart to the influence of stovaine, and supports the statement I have made elsewhere that the success of Jonnesco's method is not necessarily due to the presence of strychnine.

REFERENCES.

¹ Jonnesco, *BRITISH MEDICAL JOURNAL*. ² McGavin, *BRITISH MEDICAL JOURNAL*, 1910, ii, 733. ³ Tyrrell Gray, *Lancet*, 1909, ii, 991. ⁴ McGavin, *Practitioner*, 1908, 804. ⁵ *Loc sup. cit.*

THE ROUTINE USE OF SPINAL ANAESTHESIA:

A STUDY OF FIVE HUNDRED CONSECUTIVE CASES.

BY

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A NEW discovery, in surgery or any other craft, usually passes through certain well-defined stages of development. Originally it is in the hands of one or more enthusiasts, who produce results not remarkable for their uniform success or their practical usefulness, but merely for the fact that it is found possible to produce any results at all in an entirely novel way. The first aviators were content with showing that it was possible to fly, without caring greatly where they arrived.

The next stage is that in which a number of men apply themselves to the improvement of methods, and succeed in demonstrating that it is possible for experts to produce results of practical value. The third stage is that in which the members of the craft concerned decide whether the use of the new discovery is to be confined to experts, or whether it is sufficiently easy, safe, and useful to become part of the equipment of the ordinary worker.

It is clear that spinal anaesthesia has passed through the first two stages, and is now in the third. Without going into the history of its development in detail, the fact that it is possible to produce it has been abundantly demonstrated. The publication of a series of successful cases by men who have given special attention to it, has shown that in their hands it is capable of yielding useful results.

The question now is, Whether it is to remain in the hands of experts, like *x* rays, bronchoscopy, and the many ingenious and elaborate methods which are used in the surgery of the nose, throat and thorax, or whether it is to take its place, like iodine, rubber gloves, and Arbuthnot Lane's bone plates, in the outfit of the ordinary surgeon. And in deciding this we have to consider not only whether it is easy, effective and safe, but whether it has any such advantages over chloroform and ether as would justify us in preferring it, either in all possible cases, or in certain selected ones.

The present paper does not aim at showing what can be done with the method, nor at suggesting that still better results can be got with an improved technique or a new solution. It is simply an account of the way in which the results of its use have worked out over a reasonably large number of cases in a native hospital where the conditions are by no means ideal, and where the administration has been conducted by a large number of men without special experience. Such a record will give a broader and fairer view of the good and bad points of the method for general

use, than details of a smaller number of cases in the hands of one man.

For this purpose I have taken the first 500 cases in which it was used in my wards. Various drugs have been used, and various instruments and methods; the injections have been given by myself, my assistant surgeon, a large number of successive residents and house-surgeons, and, just recently, by the anaesthetist. In all instances the student to whom the case was allotted has filled up, at the time of administration, a form giving details of the drug and dose, the level of the injection, the nature of the operation, the time taken, the level reached by the anaesthesia, the symptoms during operation, etc. This form has then been put up over the patient's bed, and the house-surgeon on his rounds has inquired for and noted any after-effects which followed in the next few days. These forms were copied into a register on the patient's discharge.

The patients were, with three exceptions, males; they varied in age from 9 to 90, and were mostly fellahs, that is to say, agricultural labourers and small farmers, with a fair proportion of townsmen from Cairo itself.

Before the operation the patients, as a rule, had their back and operation area sterilized with iodine in the ward and covered with dressings. They were next wheeled into the anaesthetic room, and sat or lay on the stretcher with their backs bent to receive the injection. They were then at once laid on their backs, wheeled into the theatre, and lifted on to the table. Their heads were raised on a pillow, and a screen was arranged across the table to prevent them from seeing the operation, which was usually begun as soon as the re-sterilization and arrangement of towels was complete. A student was told off to sit at the head of the table to watch their condition and talk to them. At the end of the operation they were put on a stretcher and wheeled back to bed.

Technique.

As regards the technique of injection, provided that the solution is lodged in the right place, the means used are not very important. We have used a variety of needles and syringes; personally I rather prefer a Record syringe holding 3 or 4 c.cm. and the nickel needles employed by Mr. Barker. They are blunt and they bend, but one is free from the risk of a rusty needle breaking and leaving its point deep in the tissues. Whatever needle is used, it must have a stylet which fits it accurately and is ground and sharpened with it.

The disadvantage of iodine is that it hardens the skin and makes it difficult to penetrate. The risk of carrying in infection is probably overrated, and the method of introducing the needle through a drop of pure lysol placed on the skin, without previous preparation, would very likely be quite sufficient. I have used this as a routine in a large number of intramuscular injections without any ill effects; but for spinal anaesthesia in inexperienced hands there is more safety in having a larger sterilized area.

A line drawn between the highest points of the iliac crests gives the level of the fourth lumbar vertebra, and, as will be seen below, it is a matter of indifference through which lumbar space the injection is made, so it is best to choose the one which seems easiest. It is easier to go just to one side of the middle line to avoid the supraspinous and interspinous ligaments, and it should be an absolute rule not to inject the anaesthetizing solution except while cerebro-spinal fluid is actually dripping from the needle. A faint staining of this fluid with blood does not matter; the dripping of pure blood means that the needle is in the posterior spinal venous plexus. Drawing spinal fluid into the syringe to mix with the solution gives additional security that the needle is rightly placed, but has no other advantage, and the rate of injection seems to make no difference in the anaesthesia produced. A fairly common blunder is to disconnect the needle from the syringe before withdrawing it; this allows some of the injection to escape. The puncture needs no dressing. Heavy injections (stovaine-glucose) require a special arrangement of the patient, and are referred to below. The syringe and needles must be sterilized by boiling in water and not in soda solution, as even a trace of alkali decomposes the solution.

The technique is very simple and requires no special skill. All the anaesthetizing solutions can easily be procured sterilized in glass bulbs or ampoules.