

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.⁵ 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

OWEN RICHARDS, F.R.C.S., M.Ch.Oxon.,

SURGEON TO KASR-EL-AINY HOSPITAL, CAIRO; AND PROFESSOR OF CLINICAL SURGERY, EGYPTIAN GOVERNMENT SCHOOL OF MEDICINE.

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 fellaheen, that is to say, agricultural labourers and small farmers, with a fair proportion of townfolk 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.

Nature of Operations.

The operations in this series include 177 hernias, of which 22 were double, 6 were strangulated, and 30 were combined with some other operation, usually for hydrocele.

There were 117 operations on the genitals and urethra, including amputation of the penis, castration, operations for stricture and stone in the urethra, hydrocele, and varicocele, also a large number of extensive bilharzial fistulae of the perineum and its neighbourhood.

There were 37 operations of various kinds on the anus and rectum and 102 on the bladder, of which 8 were prostatesctomies, 7 cystotomies for various purposes, and the remainder mostly lithotrities.

On the legs there were 51 operations, including 8 amputations through the femur and 9 (one double) through the leg. There were 5 operations on the knee-joint, and the rest included wiring fractures, excision of the ankle, and the removal of sequestra, of varicose veins, and of innocent and malignant growths.

The only abdominal operations done were 4 removals of the appendix and 4 for fistulae of the abdominal wall.

One case of necrosis of the upper ribs was performed under cervical anaesthesia.

It will be seen that this list contains most of the common operations below the navel, and that operations above this level have practically not been attempted. It is quite possible, by injecting at a higher level, to get a satisfactory anaesthesia for abdominal work, especially pelvic; but for general use I have felt that the proper sphere of the method lies below this. In the operations mentioned above, the limitations of time and space are pretty well defined beforehand. In the abdomen this is often not the case, and it is doubtful if it is wise to teach students to rely on stovaine for their general abdominal work in the future. Gynaecology, where the main part of the work is pelvic, is, in these respects, on rather a different footing.

There is no doubt that one of the most valuable applications of the method is in abdominal conditions involving shock; but these are not routine cases, they do not come within the scope of this paper, and they are not suitable for treatment by this method except by experienced surgeons.

Results.

The results can be summarized as follows:

There were 12 cases in which it was found impossible to give any injection; these are not counted in the series.

There were 3 deaths either at the time of operation or shortly afterwards.

There were 38 cases in which the injection was given, but no anaesthesia followed, and a further 18 in which it was insufficient, and had to be supplemented by chloroform. In the remaining 444 cases the anaesthesia was sufficient. So that, working under the conditions described above, we have had 2.34 per cent. in which the method could not be used, and in the remainder there was a mortality of 0.6 per cent.; while in 11 per cent. the anaesthesia was either absent or not sufficient for the whole operation. The method proved entirely satisfactory in only 86.7 per cent. of the total number attempted. Of course, a large proportion of the failures were due to mistakes or to the use of defective instruments or solutions. Three-quarters of the failures to administer occurred in the period covered by the first 100 cases, and a number of the insufficient anaesthetics were certainly due to decomposition of the solutions.

But it seems probable that in inexperienced hands the percentage of failures from these and similar causes would not fall far short of 10 per cent.

Failures in Administration (12 Cases).

On one occasion the usual needle had been sent to be sharpened, and one only 6 cm. long was used instead. It failed to reach the canal in one case, produced only a partial anaesthesia in another, and in a third, where the depth was less, it acted perfectly.

In 2 cases the stylet was missing, and the needle—a steel one, ground rather flat—acted like a cheese-taster, and became blocked with a cylinder of ligament and fat each time it was introduced.

In 5 cases repeated attempts failed to reach the canal, and in 4 nothing but blood came from the needle. One of these last was a case in which I tried to inject a

patient for my colleague, Dr. Dobbin. The woman had an enormous ovarian cyst, her back was oedematous, and her superficial veins dilated. Probably the needle entered a dilated venous plexus behind the space.

The first three failures could have been easily avoided by using a proper needle with a stylet; the others represent a certain proportion of patients in whom it is difficult to reach the canal, either from the small size of the interval available or from the presence of a dilated venous plexus.

I do not think skill plays any great part. The problem is merely to introduce a needle through any one of the lumbar spaces, and most men, if they are told what to do and have seen it done once, can do it quite easily. If they fail in one space they usually succeed in another; nor is any harm, beyond slight pain to the patient, likely to follow an unsuccessful attempt.

Deaths (3 Cases).

Death from spinal anaesthesia, when it occurs, seems to occur at once—that is to say, during or at the end of the operation. I have only had one case in which there was any question of a delayed effect—that was of a man of 70 with prostatic retention, whose prostate was removed under novocain. He was noted as being "all right" the night after the operation, but the next day he developed coma and died. He had a large secondary pouch in his bladder and an advanced double pyelitis, so that his coma was probably renal; the only thing pointing to the anaesthetic was some oedema of the brain. He can hardly be considered an anaesthetic death.

The 3 deaths due to the anaesthetic all occurred on the operating table. In a good many patients there is some depression soon after anaesthesia is established, shown by vomiting, yawning, or faintness, and where patients are in a critical condition this may go on to actual failure of heart or breathing.

1. The first case was a man of 90 with an enlarged prostate, who was so feeble that he seemed unfit for chloroform. Moreover, I had recently had a good result with a similar case in which the patient seemed to have no shock, and could be fed at once after the operation, so I decided to give him stovaine. At the end of the operation, which lasted seventeen minutes, his pulse and breathing failed, and he died half an hour later.

Post-mortem Examination.—Emphysema, fatty heart, one kidney destroyed by calculus.

2. A man of 45 with a suprapubic fistula, who died in a few minutes of heart failure.

Post-mortem Examination.—Advanced bronchitis, commencing bronchopneumonia, acute pleurisy, tricuspid orifice $5\frac{1}{2}$ in. round, septic bladder and kidneys.

3. A young man who had had an amputation for crushed leg the day before, and developed free haemorrhage from the stump. He was given stovaine while the flaps were opened up, and died in seven minutes. This case was under the jurisdiction of the Parquet, and the body decomposed before any examination was made.

In the first case my short experience of the method (36 cases) led me to expect too much help from it. In a similar case I should now insert a suprapubic drain under cocaine.

The second patient should never have come to operation, and would not have done so had the routine examination of the chest in the ward been carried out properly.

In the third case the risk was great. The shock of the accident and the previous operation added to loss of blood then and later, made him unfit for any further anaesthetic, and what was necessary would have been better done without one.

It is probable that all three would have died under chloroform, and their deaths should not, I think, be credited to any special danger inherent in spinal anaesthesia, although it is necessary to record the fact that they did occur under it.

I may add that since the conclusion of this series of cases I have had no further deaths under spinal anaesthesia in my section.

Complete Failures (38 Cases).

In these instances cerebro-spinal fluid escaped from the needle after insertion; the injection was apparently successful, and yet no anaesthesia followed. Some cannot be explained, but a good many were due to some fault in the solution. For example, I ordered a stock of three different solutions from a first-rate firm of London chemists. These arrived, and proved successful in a

number of cases. Then several failures occurred in succession, and little oily drops were noticed adherent to the sides of the ampoules. I ceased to use them, and later received a letter from the chemists to say that they kept control ampoules, and that these had decomposed. The fault apparently lay in the kind of glass used for making the bulbs. Ordinary glass, rich in sodium, has a good deal of soluble alkali in it, and stovaine is decomposed by any trace of alkali. If distilled water is boiled in a new glass beaker, it becomes alkaline to a test solution, and at least two days' steaming is required to extract this soluble alkali. The only glass which is nearly free from soluble alkali when it is new is the hard Bohemian glass, containing more potassium than sodium. The best results were got by using ampoules from a French firm (Poulenc), and even with these, which are made of hard glass, I find notes on three occasions that after a group of failures "a new box" of the same solution has acted perfectly. Two of these notes were in August and one in May, so that probably the heat of the Egyptian climate is partly to blame. Solutions made locally and put into bulbs of ordinary glass were responsible for several failures, probably for the same reason. Ampoules are so clean and handy and portable that for general outside use it would be difficult to replace them, although freshly made solutions are probably more reliable. But the French ampoules would probably be satisfactory in a cool climate.

Partial Failures (18 Cases).

In one case there was "partial anaesthesia of the scrotum and paralysis of the legs" after ten minutes, but after fifteen minutes the anaesthesia was localized in the right side of the scrotum only. This suggests that the solution (injected in the third lumbar space) had been partially deposited outside the common cavity. In another the fluid is noted to have flowed "very freely" from the needle, and "very little was allowed to escape." The case preceding, which received on the same day the same dose of the same solution, also had "a very free flow," but it is noted that "plenty" was allowed to escape, and the anaesthesia was excellent. This suggests that where the pressure is very high there may be a certain amount of leakage into the tissues from the puncture in the dura, unless the intradural pressure is relieved before injecting.

In another case the needle was disconnected from the syringe before withdrawal. Loss occurred, and the anaesthesia, which was in other respects satisfactory, disappeared before the end of the hour occupied by the operation.

In several other patients the anaesthesia was good, but passed off early. It was sufficient for the operation on one side of a double hernia, but not for the other (2 cases); or for a hernia but not for its accompanying hydrocele (2 cases); or it ended in 20 minutes, 27 minutes, 30 minutes, 20 minutes, etc.

In other instances the anaesthesia was sufficient locally, but traction on the mesentery caused epigastric pain, and chloroform was given to avoid this; while in yet others anaesthesia was partial throughout. So that these partial failures resolve themselves into cases where the anaesthesia was too short, those in which it was too low, and those in which it was too weak. Apart from errors of technique they were probably due to the routine dose being insufficient for the individual patient, or to some defect in the solution.

Symptoms at the Time of Operation.

In a fair number of cases some depression follows the onset of anaesthesia; the patient yawns, complains of feeling sick or giddy, and very commonly asks for a drink of water. In a few this is marked enough to require brandy or strychnine. This stage only lasts for a few minutes, and then the patient settles down into a condition of mental and bodily comfort, which lasts till the operation is over.

Altogether there were 16 cases of vomiting, 7 of nausea, and 5 of faintness sufficiently marked to be noted. Quite apart from this group of symptoms, there have been nausea and epigastric pain (in one case actual vomiting) produced by pulling on the peritoneum or the cord in hernia operations. This was noted in only 4 cases, but occurred to a slight degree in many more; it was never serious. In the same class are the cases, of which 3 are

noted, in which forcible distension of the bladder in washing out after a lithotomy caused pain, although the interior of the bladder was apparently anaesthetic.

These are simple examples of interference with a sensitive region above the level of anaesthesia. They can be avoided, as a rule, as soon as the patient begins to complain.

If patients have not had a preliminary purge their bowels are often opened on the table, simply from relaxation of the sphincter. This is unpleasant, but can hardly be called a symptom; it can be avoided by giving an enema previously in the ward.

Symptoms following Operation.

For these I have had to depend in most cases on the notes of my house-surgeons made on the slip hung over the bed for the purpose. In 107 cases no note was made. Inquiry showed that this was very seldom due to slackness, but to the fact that the house-surgeons, especially new ones, did not appreciate the importance of recording the absence of symptoms. If there was nothing to record they contented themselves with not recording anything, and one may fairly assume that in these cases there were at any rate no symptoms requiring treatment.

In 186 cases there was a definite note that the patients had no after-effects whatever, and in a further 115 there was only some headache or backache lasting a day or less. So that it appears that in 402 cases (80 per cent.) there were no after-symptoms of importance.

Of the patients presenting symptoms, most complained of pain in the head or back. In 54 cases this lasted for two days, in 27 for three or more, and it was in some instances severe; so that the proportion of serious backache and headache was considerable (about 16 per cent.), and these symptoms occurred in some degree in nearly 40 per cent.

This was a serious drawback to the method, and various devices were used to avoid it. Allowing fluid to escape freely at the time of injection, diluting the solution by drawing up spinal fluid and injecting slowly, had no effect. Mr. Thom, lately Resident at the hospital, in his paper¹ on the use of stovaine in shock, remarks on the rise of pressure which took place in one case between the first and second injection of stovaine, and suggests running off the spinal fluid at the end of the operation in order to avoid after-effects. He suggested this to me at the time, and it seemed reasonable to suppose that it would do good, not only by relieving the pressure but also by withdrawing some of the solution employed. I tried it in 8 cases, removing as much fluid as ran freely just before the patient left the theatre. Of these 8 cases, 5 had no symptoms, but the other 3 had backache and headache. Drugs and purgatives had no better effect.

The headache seemed to depend on some later reaction, for, though many patients complained of it the same night or the next morning, with others it did not begin till two or even three days after the operation. The most probable explanation was that it was due to a reaction of the irritated membranes, leading to a rise of tension some time after the irritant had been absorbed or had decomposed. This suggested tapping the space, not immediately after operation, but later, when the reaction and rise of tension had already developed. In three severe cases in which this was done complete and lasting relief was produced within a few minutes, but whether this would always be the case it is not possible to say. My own impression is that persons with serious illness and low vitality enjoy a certain immunity to these after-effects, and this may be due to a naturally low blood pressure. Certainly, my patients—all men, and many of them well and vigorous—suffered much more from headache than Dr. Dobbin's gynaecological patients. This difference, which has often puzzled me, may possibly be accounted for by the men's higher level of strength, vitality, and (presumably) blood pressure; for it can hardly have a sexual basis, and the conditions are otherwise practically the same. We employ, as a rule, the same dose of the same solution given in the same way for both men and women.

Amongst the various symptoms noted in addition to these are post-operative vomiting (2), rigor (6), giddiness (1), slow thinking and dullness (3), loss of rectal control (1), twitching of the occipito-frontalis (1), pain in the eyes (1), pain in legs (7), numbness and weakness (3), retention (2), loss of memory for two days (1), impaired

movement of leg (1). A good many also had a rise of temperature for a day or two.

This seems a serious list, but actually (except for a case of pain in the legs which lasted in some degree for a week) these symptoms were not severe, usually passed off in twenty-four hours, and never lasted for more than two days. The completeness of the list is due to the keenness and thoroughness of the house-surgeons; for our patients do not of their own accord complain of anything except severe pain, and would not be likely to volunteer statements as to slowness of thought and dullness.

The only patient of these 500 who showed anything like a lasting after-effect was a policeman, who complained of persistent pain in the back after an injection of tropacocaine for a lithotomy. He attended my out-patient department for several weeks, and was given "light duty"; finally he ceased to attend, and I suppose went back to duty. The Egyptian police are mainly conscripts, and even in the British volunteer army idiopathic pain in the back is sometimes brought on by the mere prospect of a hard day's work. It is likely that this policeman started with a genuine backache, and, finding it attracted a flattering amount of attention and allowed him a life of leisure, was loth to part with it.

Of the serious ocular and other paralyses which have been put on record I have as yet had no experience here, either in this series of cases or out of it.*

The Solutions Used.

These include novocain, tropacocaine, stovaine, stovaine-glucose, stovaine-strychnine, and stovaine-adrenalin. They differ to some extent in their action, but are all capable of producing a workable anaesthesia.

Novocain was used in the form of tabloids having the following composition:

Novocain	...	...	0.15 gram
Suprarenin borate	...	...	0.000325 gram
Dissolved in 3 c.cm. normal saline.			

Two cases were successful; the anaesthesia was perfect and lasted in each case for one and a half hours. They both had a rigor and headache afterwards. The third case was the prostatectomy described with the fatal cases; the patient died on the following day. I do not think the novocain can be blamed for the death, but I decided not to use it again, as these three cases, done on the same day, were not encouraging.

Tropacocaine was procured in the form of powder, of which about 0.5 gram dissolved in water or saline was given in 25 cases. The peculiarity of this drug lay in the height of the anaesthesia (which with lumbar injections commonly reached the third or fourth rib) and in its character. It was an analgesia rather than an anaesthesia. The sensation of pain was abolished, but that of touch remained, and there was very little paralysis; several patients were noted as being able to move and raise their legs throughout.

A typical case was the first one, in which the anaesthesia rose to the level of the third rib with an injection into the second lumbar space. The note is: "Motion unaffected; the patient could raise his legs and kick. Analgesia absolute; ordinary sensation present in some degree all over, but not interpreted rightly. No after-effects." This probably renders tropacocaine a safer drug even with high anaesthesia, but from the operative point of view a complete paralysis such as is given by stovaine is rather an advantage.

Stovaine-glucose (Barker) was given in 13 cases. The formula used was:

Stovaine	...	...	0.10 gram
Glucose	...	...	0.10 "
Water to	...	...	2.00 c.cm.

put up in ampoules locally. About half this quantity was generally used.

It was easy, by varying the position of the patient in accordance with Mr. Barker's directions, to produce at will

* *Correction while in the Press.*—A case has just come to my notice in which persistent headache followed the use of stovaine. The patient was a man who came in in March, 1911, with a parasitic granuloma. He was given stovaine; this failed, and the operation was performed under chloroform. In June, while I was in England, he returned, complaining that some degree of headache had persisted since the date of the operation. He was treated for a few days, and discharged relieved; he has not returned since. I never saw him, and cannot say how far his headache can be connected with the stovaine.

either a pure sacral anaesthesia—that is, over the lower two-thirds of scrotum, perineum, anus, back of thighs and sacrum, and legs below the knee—a lumbar anaesthesia, or (for demonstration purposes) a unilateral anaesthesia becoming bilateral when the patient was rolled on to his back. The after-effects were rather severe; 10 out of 13 cases had headache and backache in varying degrees.

The method is satisfactory and manageable, but for doing operations for hernia, stone, etc., has no advantages over the lighter solutions, while for teaching students it has the drawback of requiring more care and sense. What is required for teaching and general use is a method which shall be reasonably safe even in the hands of a careless or stupid anaesthetist. The precision with which the injection can be placed in a desired region makes one fear that under such conditions it might be localized equally definitely in an undesired one. With stovaine-adrenalin it requires no special skill or care to produce uniform results sufficient for any operation below the navel, and it is difficult to convert them into anything dangerous.

So that although theoretically and in capable hands a heavy solution is better, in the way in which a pistol is better than a blunderbuss, for routine work in inexperienced hands its disadvantages seemed to me to outweigh its advantages.

Stovaine was used alone in 53 cases, in a dosage of about 0.06 gram dissolved in water or saline; and

Stovaine-strychnine in 25 cases, with a formula—

Stovaine	...	...	0.10 gram
Strychnine	...	...	0.001 "
Water to	...	...	1.00 c.cm.

and a dosage of from $\frac{1}{2}$ to 1 ampoule.

Both of these were satisfactory enough, but they had the disadvantage of giving a rather shorter anaesthesia than stovaine-adrenalin. They contributed rather more than their share to the cases where the anaesthesia was of insufficient duration, and with the stovaine-strychnine especially there was apt to be a partial return of sensation towards the end of the operation. There seems to be no special advantage in introducing strychnine into the spinal cavity in every case, where it can be so readily given hypodermically to those patients who show signs of needing it. It apparently enables larger doses of stovaine to be given, but if the resultant anaesthesia is no longer or better this is clearly no gain.

The use of stovaine-strychnine for high anaesthesia is referred to below.

Stovaine-adrenalin (Billon) was used in 381 cases. Its formula is:

Epirenin borate	...	...	0.0026 gram
Stovaine	...	...	0.08 "
Sodium chloride	...	...	0.0022 "
Water to	...	...	2.00 c.cm.

and its specific gravity is just about that of cerebro-spinal fluid. As a rule about 0.06 of stovaine was given; less often the whole bulbful was injected.

It gives a very constant anaesthesia of ample duration. The suggestion that the adrenalin is the chief cause of after-effects does not seem to have any truth in it. Comparing the 116 cases done with solutions free from adrenalin with those done with solutions containing adrenalin, the proportion of one and two day headaches works out almost exactly the same; while in the 24 cases of headache lasting three days or more, the proportion due to solutions containing adrenalin happens to be less than half that due to the other solutions.

The other less weighty objection to adrenalin is that it is unnecessary. But I think, though it is not possible to prove it from my notes, that it does actually prolong the anaesthesia, and my colleagues, as well as myself, after trying various solutions, have come now to using this combination almost exclusively. At the same time the difference is not great. Results of the same class can be got with many different formulae, and it is more important to come to some conclusion as to the value of the method as a whole than to discuss the relative merits of the drugs used in it.

The Level of Anaesthesia.

This varied with different solutions. With stovaine-adrenalin the results can be summed up by saying that with few exceptions an injection into any of the lumbar spaces produces anaesthesia as high as the navel, while

injections into the lower dorsal region extend it to the lower end of the sternum.

Of these 381 cases, there are notes of the extent in 275; in the others it is either not noted, or described as "sufficient" or "insufficient."

Thirteen cases injected in the first lumbar space had an average of 1 in. above the navel, more than half reached exactly to it, and only one fell below it.

One hundred and twenty-seven cases injected in the second lumbar space averaged within half an inch of the navel, and 86 (over two-thirds) reached exactly to it.

One hundred and twenty-one cases injected in the third lumbar space averaged within half an inch of the navel, and 84 (over two-thirds) reached exactly to it.

Of 10 cases injected in the fourth lumbar space, in 8 the anaesthesia reached exactly to the navel.

Most of the patients were injected sitting, and immediately laid flat on their backs.

It seems clear that under these conditions it makes no difference through which lumbar space the injection is made; the result is nearly always anaesthesia up to the level of the navel.

The level can, however, be altered to some extent by position. In several cases where the anaesthesia was at first too low it was raised in a few minutes by lowering the head end of the table, and could be made to rise and fall several times in the same way. This was noted at the time in five patients, but occurred in many more. If we are dealing with an inelastic fluid of uniform specific gravity contained in a rigid tube, it is not clear why this should occur; but it undoubtedly does occur, and provides a very useful working adjustment.

Injection into the dorsal region (10-11-12 D.) gives anaesthesia averaging just above the xiphisternum, but as I have used it in very few cases, while it has been extensively employed by other writers, not much need be said about it here. It gives a good relaxation of the abdominal wall.

Injection into the cervical region, as recommended by Jonnesco, is never likely to be used extensively. I tried it in 2 cases only. In each there was a flow from the needle and the injection was easy. The first case had no anaesthesia, nor any ill effects, and probably the fluid went astray.

The second patient was a man with caries of the upper ribs, who received 0.03 gram stovaine with strychnine in the first dorsal space. He had anaesthesia of the arms and head, none of the legs, and the operation was carried out. A quarter of an hour after the injection was given respiration ceased and had to be carried on artificially for about ten minutes. The patient then recovered, was returned to the ward, and passed into a condition of noisy mania, which was succeeded by entire loss of memory for two days. After this he recovered completely.

I have not used the method again. There is no doubt that anaesthesia can be produced in this way, but there is too much risk of its becoming general and permanent.

Duration.

It was found impossible as a matter of routine to determine the duration of anaesthesia. Those cases in which it fell short of the requirements of the operation are classed under partial failures. In the rest it was sufficient, and how far it was excessive was not determined.

In the only cases of which I have notes—16 in number—it varied from half an hour to two and a half hours, and averaged an hour and ten minutes. Most of the operations lasted, more or less, about half an hour, so this leaves a good margin. The longest lasted an hour and three-quarters (lithotomy of a large stone).

These figures were taken from the time when sensation and motion began to return in the legs, but the workable anaesthesia is probably longer, for the recovery of full sensation is gradual. With fairly rapid operating the anaesthesia was ample for the kinds of operations which were done. When it is not it is quite possible to give a second injection. The reason I have not done so is that it involves so much disturbance of the patient, and increases the risk of sepsis.

Mental Condition of Patients.

Most of our patients were of a stolid rustic type who took things as they came. They were sometimes rather

apprehensive till the operation was begun, and then, finding that they were not hurt, they became quite contented. They sometimes talked to the student, or smoked cigarettes, and one man volunteered a song while his thigh was being amputated.

It is a mistake with nervous patients to test carefully for anaesthesia, for to do so destroys their confidence and gives no information of value. Men of this type profess to feel the slightest touch if they are questioned, but a 4-in. incision, quietly made, causes no break in their conversation. Practically the preparations on the table give ample time for anaesthesia to develop.

It is, of course, essential to have a proper screen; a sterilized towel on an iron hoop clipped to the table does very well. The patient's line of vision is so low that this cuts off the instrument table and assistants from his sight, and yet it allows the operator to see his face and speak to him. One difficulty, dislike of exposure before an English sister, has never been raised; there seems to be a complete mental detachment from the region anaesthetized. If there is a specimen, such as a stone or a prostate, the patients often ask to see it and sometimes want to take it away.

It is very difficult to find out whether patients really prefer spinal anaesthesia to general. The chief attendant in the surgical wards, who has the most chance of knowing, has several times assured me that they do. Apparently the chance of feeling pain has less terrors for them than that of going to sleep and not waking up.

I once found a man making a disturbance in the anaesthetic room, demanding to be discharged rather than have chloroform. I took him into the theatre and let him talk to a patient who was being operated on for hernia under stovaine. The patient laughed at him, and assured him it was quite enjoyable ("By God, a sweet thing, my brother"), so he had his operation under stovaine and departed loudly grateful. It is, of course, a question of temperament. Frank Buckland is said to have refused chloroform on the ground that he wished "to be present at the operation"; many people would risk a good deal to avoid "being present." It is, at any rate, an advantage, when patients have any strong views on the point, to be able to give them their choice.

On one occasion we tried to treat hysteria with stovaine. The patient was sent to me by Dr. Warnock, Director of the Government Hospital for the Insane. She was a buxom girl of about 25, quite sane, but possessed by the idea that her legs could not be extended. She carried her objection to stovaine so far as to bite one of the dressers, but a little later she was able to sit and contemplate her extended legs for nearly two hours. At the end of this time she gradually drew them up, and the next day they were less flexed, but she threatened a contraction of her arm. She was discharged to her home, unrelieved.

Natives of this class treat hysteria as an evil spirit and exorcize it by various ceremonies, one of which consists in the patient riding a sheep round the room to the sound of tambourines, and subsequently drinking its blood. This is probably as good a treatment as any other, but for educated patients, stovaine, represented as a remedy, might possibly make a lasting mental impression. At any rate, it allows the patient to see for herself that extension and passive movement are possible, whereas with a general anaesthetic she has only evidence at secondhand.

Conclusion.

The cases on which this paper is based give a reasonable ground for forming an opinion on the value and drawbacks of spinal anaesthesia as a routine method in a busy native hospital. The successful cases call for little comment, but I have tried to deal fully with the failures.

A question which is often asked is whether spinal anaesthesia is "better than chloroform." Looked at broadly, it certainly is not. The discovery of stovaine by surgeons who already possessed chloroform excited a good deal of interest and appreciation; it is nothing to the enthusiasm with which the discovery of chloroform would have been greeted by men who knew no anaesthetic but stovaine. The mere fact that chloroform produces with certainty an anaesthesia of the whole body puts it into a different category from an agent which produces with a high degree of probability an anaesthesia of part of it. The question is whether, in cases in which both are available, spinal

anaesthesia ever possesses advantages over chloroform sufficient to make us prefer it. For certain operations we prefer cocaine. No one suggests that it can replace chloroform, but we should be sorry to be without it.

Spinal anaesthesia has a great many good points. It seems reasonably safe—reference to the three fatal cases in this series shows that any one of them would have been a bad risk with chloroform. Its materials are portable and convenient, everything necessary for a dozen cases will go in a pocket. The after-effects may be vexatious, but none of them so far have been very serious or at all lasting. The anaesthesia produced is fairly constant in its extent and of reasonably long duration. The technique is simple and uniform, and does not demand the experience and judgement of a skilled anaesthetist for the whole period of the operation. In fact, it is quite simple for the surgeon, working single-handed, to produce the anaesthesia and then operate at his ease, with an occasional question or a glance at the patient's face. This is one of the chief advantages. During nearly the whole of the period covered by this series of cases I was without the services of a competent anaesthetist, and the risks and drawbacks of the method had therefore to be compared, not with those of chloroform skilfully given, but with those of chloroform in the hands of an untrained man. Now that a capable anaesthetist has been appointed to this hospital the conditions are different, but one may fairly expect stovaine in his hands to show results rather better than my own.

In general practice in the country it must often be difficult to get an assistant, and more often difficult to get one who is in the habit of giving anaesthetics. The use of stovaine, at any rate, reaches a fair level of efficiency in inexperienced hands, the personal equation is less disturbing, and this level of efficiency can be reached by a man working single-handed.

The dangers of stovaine are negligible compared to those of a confident and inexperienced chloroformist, or to those of chloroform given fitfully by the operator or by a layman. Another advantage of stovaine in the case of patients of poor vitality is that, instead of preliminary purging and fasting, and subsequent nausea, the patients can be fed at any time up to, during, and after the operation. With two of my cases—old men with enlarged prostates who were very weak—this appeared to be a great help. They were fed up to time of operation, and given hot rum and milk immediately after it, and did not suffer from shock.

The muscular relaxation obtained with stovaine is more marked than with deep chloroform anaesthesia. The sphincter ani becomes so flaccid that motions are often passed on the table, unless the rectum has been previously emptied. Anal operations are rendered much easier, and the sphincter requires scarcely any stretching. In the same way a bladder which is contracted and irritable often gives rise to a good deal of trouble and delay under chloroform, the chloroform having to be pushed before the bladder can be adequately filled. The abdominal muscles harden over it, and it is not easy to tell if the resistance to distension is an active or passive one. With stovaine a bladder of this kind dilates at once to its maximum size under quite a low pressure.

For setting fractures the difference between the two is less, but is still in favour of stovaine.

When a large number of cases have to be dealt with, spinal anaesthesia saves a good deal of time, not only in administration, but also because, if the list is finished unexpectedly early, other waiting cases can be added to it without preparation. If there is much work or many emergency cases, it sometimes happens that minor cases, such as hernias or hydroceles, are prepared two or even three days in succession and left over for want of time. This is very trying for the patients, and can be avoided by using stovaine.

This exhausts the most obvious advantages of stovaine for cases of the kind described above. Of its use in gynaecology I have no experience, and I have practically not attempted to extend its general use above the umbilicus for reasons already given.

Its disadvantages are considerable. In the first place, it is not absolutely trustworthy. Under the conditions described above there were over 10 per cent. of partial or complete failures, and if it is necessary to have a chloroformist in waiting in case the stovaine does not work, its

chief advantage for general use is gone. Possibly this estimate is too pessimistic, and when no anaesthetist is available, it is at any rate 9 to 1 on stovaine saving the situation. And where two men are available it is better to have an assistant, with a 1 in 10 chance of his ending up as an anaesthetist, than to devote him to that duty from the start.

Again, the anaesthesia fails where it is necessary, as in abdominal work, to extend the operation higher than was anticipated, but in the class of cases which compose this series this question does not arise.

The dosage cannot easily be varied in the course of an operation, it can be adapted beforehand to the patient's age or size, but not to his idiosyncrasy. In order to reach the necessary level and full degree of anaesthesia, a dose must be given which will produce an effect lasting about an hour, even if the operation is going to be over in ten minutes. As a matter of fact increased duration of the anaesthesia does not seem to involve any increased tax on the patient's strength. The patients fail, if they fail at all, at the beginning of the anaesthesia, and apart from loss of blood improve towards the end. Of course an overdose of chloroform can be checked by stopping its administration, while an overdose of stovaine goes inevitably on. But actually the risk of an overdose is probably less with stovaine than with chloroform; one is dealing with an exact quantity of a pure drug, whereas with chloroform given on a mask the amount which enters the patient's system bears no constant relation to the quantity dropped from the bottle, and can only be roughly guessed at from the effects it produces. The rate of administration, which is so important with chloroform, also plays no part in spinal anaesthesia. So that, though the original administration admits of no adaptation afterwards, the state of the patient is the only factor not accurately known and controlled. Giving chloroform is an art; giving stovaine is a scientific experiment.

As to the after-effects, experience differs. Mine has been less fortunate than the reported results of others. To make any fair comparison one should question a similar number of chloroform cases, and probably they would furnish a fairly formidable list of discomforts. But after chloroform these are expected and taken for granted, whereas when they occur after stovaine they are sought for and diligently recorded. Although backache and headache may be a nuisance, or worse, to the patient, they do not have the disastrous effect on the wound that is sometimes brought about by the violent sickness occurring after the administration of a general anaesthetic. If permanent damage were caused by stovaine the position would be different; so far, I have seen no instance of it. A consideration lying outside the scope of this comparison, but important in a teaching hospital, is the necessity of giving students sufficient experience of the use of chloroform. This is chiefly a question of the amount of material. If this is small the students suffer; if it is ample they gain, by learning two methods instead of one. There is no question as to the necessity of all students learning to give chloroform; this learnt, there is much advantage in their learning to use stovaine as well.

The class of cases in which stovaine offers advantages has been partly indicated above. In unskilled hands it is probably safer not to attempt to get anaesthesia above the navel—but this is a matter of opinion. Bladder and rectal cases show the method at its best, and the excellent short paper by Mr. Thom, quoted above, shows what may be done with it in cases of shock from injury. I was particularly impressed by his third case, which I saw at the time; and his concluding remarks on the use of stovaine in fractures can hardly be improved on. In combating shock from injury it cannot be compared with chloroform, for it does good where chloroform does harm.

Its routine use in herniae and operations on the legs will probably remain for some time a question of the preference of the patient and the taste of the surgeon.

The most significant testimony to the value of this method is that both my colleagues and I have gradually come to use it more and more. Dr. Dobbin, in the gynaecological section, uses it almost exclusively; Mr. Madden, on the surgical side, to about the same extent as myself. The total number of operations performed in the surgical theatres of this hospital in 1910 (excluding gynaecological and minor operations which are performed elsewhere) was

1,261, and of these 662, more than half, were performed under spinal anaesthesia. The first cases were done in October, 1907, so that the method has ceased to be a novelty, and the increase has been a gradual one. Moreover, a large number of these operations were done by assistant surgeons or house-surgeons, who used the anaesthetic they preferred.

To sum up, it is clear that spinal anaesthesia, owing to its limited field, can never replace chloroform. If we are to be limited to one method that must, of course, be general anaesthesia. But, in the ground common to both, there is not a vast difference between the two methods in case, safety, and effectiveness, if these are taken together over a large number of cases. What there is, is slightly in favour of general anaesthesia. Yet in a number of cases spinal anaesthesia offers advantages which cannot be got in any other way, and its apparatus and technique are so simple that it is worth any surgeon's while to use it whenever there is anything definite to be gained by it. In the large number of cases where there is nothing to choose between the methods, the use of stovaine becomes a matter of taste and convenience.

There seems to be a tendency in England to regard spinal anaesthesia as a dangerous method, and one that can only be employed successfully by a few experts who have devoted their attention to it. As far as my experience goes this is less true than it is of chloroform—the danger of spinal anaesthesia is about the same, and the skill required for its administration less.

In conclusion, I should like to express my especial obligation to Dr. Aly Bey Ibrahim, my assistant surgeon, and my thanks to the English and Egyptian residents, especially Dr. Thom and Dr. Maloney, to my successive house-surgeons, and to Dr. Shahin, recently appointed anaesthetist to the hospital, who have helped me by anaesthetizing cases, by keeping notes, and by making valuable suggestions.

REFERENCE.

¹ *Lancet*, October 1st, 1910.

A CASE OF PAROXYSMAL TACHYCARDIA.

BY

R. O. MOON, M.D. OXON., F.R.C.P.,

PHYSICIAN TO THE WESTERN GENERAL DISPENSARY, MARYLEBONE,
AND TO THE HOSPITAL FOR DISEASES OF THE HEART, SOHO.

M. K., a tailoress, aged 35, came up to my out-patient department at the Heart Hospital in 1909 complaining of palpitation of the heart and pains in the chest for some years. On feeling the pulse I found it was beating at the rate of 180, but examination of the heart disclosed nothing abnormal beyond the rapidity of the pulse.

She was said to have been delicate from childhood, and began to be subject to these attacks of rapid heart beating and palpitation some fourteen years previously. There was no history of any other illness. The attacks used to come on about every five or six months, beginning quite suddenly and unexpectedly, very often soon after food, but also quite frequently in the night. She herself associated the attack with indigestion. The attack would last any time from four to twenty-four hours and then pass off gradually. As is generally noted in these cases of paroxysmal tachycardia, she was not very much distressed, and would go to her work as usual; she could not, however, lie down during an attack, and therefore when it occurred at night she was a good deal troubled by it. On only one occasion did she complain that she had severe pain in an attack.

I saw her from time to time, when her pulse was usually 76, but I never saw her with the tachycardia again as on the first occasion. She could never be persuaded to come into the hospital, but by treatment of the indigestion she became much better, the attacks very infrequent, and her condition generally improved. In August, 1910, however, she had two attacks lasting seven and ten hours respectively, after which there were no more. I saw her in January, April, and May, 1911; each time she complained of feeling generally weak, but there were no more attacks of tachycardia, and after May 15th I did not see her again. Apparently she had been fairly well till September 2nd, and was at work that day the same as usual, but about midnight she was seized with an attack. The friends with whom she lived were not alarmed, as it appeared to them no different from other attacks; but she soon complained of very severe pain, calling out with the pain, which she had never done before, and saying that she was dying. At 4 a.m. she became very quiet, and died at 4.30. As she had not been to the hospital for four months an inquest was held, and the post-

mortem examination, which was made by Dr. Freyberger, disclosed an unusually large patent foramen ovale, but an otherwise normal heart.

Clinically I had never found any evidence of an organic lesion of the heart, and I looked upon the case as one of simple paroxysmal tachycardia. Had we been able to take her into the hospital, some features pointing to the congenital lesion might have revealed themselves. I have not come across, in the literature on the subject, any other instance of paroxysmal tachycardia being associated with a congenital lesion, and consider that in this instance the association was a purely accidental one. Although the ultimate prognosis in paroxysmal tachycardia is unfavourable, yet I think anything in the nature of sudden death is distinctly rare; as a rule, the attacks become more frequent and last longer, the heart dilates, and we have all the signs and symptoms of cardiac insufficiency with backward pressure.

In my experience, most attacks of paroxysmal tachycardia terminate abruptly, the heart appearing to the patient to be jerked, so to speak, into the right place. However, in this case the patient was quite clear that the symptoms passed off gradually.

LEUCODERMIA UNDERGOING PIGMENTATION
ON EXPOSURE TO SUNLIGHT.

BY

K. H. JONES, M.B., CH.B. VICT.,

STAFF SURGEON, R.N.

IN view of the interest recently exhibited in certain pathological conditions of the skin, concerned with the comparative absence or excess of pigment in its layers, notes of the following case may be worthy of record.

G. A. L., aged 18, entered the Royal Navy as a youth, in January, 1911, and came under my care for a scalp wound in March of the same year. A few days after his entry on the sick list I saw him stripped to the waist, and the fact that he was subject to leucoderma in a high degree was at once obvious. The condition affected the skin of the neck in front and behind, as well as that of both groins. The usual condition obtained in this case—there was a brownish pigmentation of the skin, and the patches devoid of pigment lay in the coloured portion. There was a yellowish ochreous coloration of the skin of the sides and the front of the neck above the clavicles, and above the vertebra prominens behind, and a much slighter pigmentation of that over both scapulae. On the left side of the neck were two large oval patches of leucoderma about 1½ in. long, and about ¾ in. wide, their long axes being approximately horizontal. In front of these patches and above them was a much smaller one, of about the same shape. On the right side of the neck were two small oval patches. Posteriorly a large butterfly-shaped patch had its head at the vertebra prominens, and extended over both scapulae. In the region of the groins pigmentation and leucodermic patches were less well marked than in the neck.

This youth was of a fair complexion, with blue eyes, and his skin was of the cream-coloured tint that tans a deep brown on exposure to the sun. He was sturdily built, enjoyed general excellent health, and had had the leucoderma ever since he could remember. There was not the slightest suspicion of syphilis in this case, but it is of interest that the distribution is that usually associated with syphilitic leucoderma.

In July I had occasion to look at this youth again, and at once noticed a change in all the leucodermic patches on the sides of the neck which were exposed to light. In all there appeared a reddish blush of inflammation, and in all, but especially in the two largest on the left side of the neck, there had developed numerous oval and rounded areas, 2 or 3 mm. in diameter, and of a brown colour; whilst a pigmentary invasion of the periphery of the patches was also seen to be taking place. At the back of the neck and in the groins, where no light reached the leucoderma, no change in them had taken place.

This youth had previously to his entry into the navy worn a high collar, and had been engaged in an indoor employment. Having to wear the characteristic open collar of a bluejacket, exposed to the light, and particularly the sunlight, portions of his skin which previously had been covered, and the pigmentary invasion of the leucodermic patches was probably the result.

It is stated by many authorities that the pigment increases in these cases during the summer, and particularly at the edges of the leucodermic patches. Stelwagon of Philadelphia, cites a case in which all pigment was