PERCAINÉ SPINAL ANÆSTHESIA.

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This note on a short series of cases is submitted in the hope that others who have employed this form of anaesthesia may criticise the observations I have made and give in turn details of their own experiences.

It would be interesting to know whether percaine is affected by storage in a tropical climate.

The simplicity of administration, the certainty of the required stage of anaesthesia, the absence of risk to the patient both during operation and afterwards, and the absence of any after ill-effects as shown in the cases observed, lead me to anticipate a very great increase in the general employment of this anaesthetic by medical officers of the Services.

The "one-man" operation is now possible, for the surgeon can be at the same time anaesthetist, instrument-clerk and dresser. This should be of great importance to medical officers in the smaller stations at home, but more especially abroad where expert assistance by anaesthetists is sometimes not obtainable.

Dozens of abdominal operations have been performed with this anaesthetic by a surgeon without the presence of another medical officer.

It is always advisable, however, that, when possible, another medical officer should be present in case his assistance is required, either in the performance of the operation or in giving general anaesthesia to assist the spinal anaesthesia.

Abdominal emergencies, in which the risk to life is increased by delay or by a general anaesthetic administered without experience, can be safely dealt with by any medical officer having this anaesthetic in his possession and some knowledge of its administration.

During the past twelve months I have made fairly constant use of percaine for inducing anaesthesia by spinal injection. Out of a total of 283 operations, 117 have been performed successfully with this anaesthetic.

Though percaine can be used for intra-abdominal operations or other operations below the level of the ninth intercostal space, it may be contra-indicated for the following reasons:—

(1) The patient may be too ill to permit of his being turned about as required in the administration of percaine. (2) There may be evidence of shock to contra-indicate use of percaine. (3) Patients may be extremely nervous or excitable, and may show considerable mental reaction to spinal puncture both during the operation and afterwards, although they feel no pain and the premedication has been given as usual.

Before employing this anaesthetic I heard many adverse criticisms as to its ill-effects, such as: (1) Severe headache lasting for weeks and completely
prostrating the patients; (2) the frequency of chest complications; (3) cramps and aching pains in the back and lower limbs.

I found that headache was present in a few cases operated on in the first two or three months of this series. It was never severe, but in at least two instances was present intermittently up to the twenty-first day after operation. With the modified technique now employed, "spinal headache" and pains in the back have not been encountered for the past six months.

Chest complications have been entirely absent except in those cases showing signs of bronchial infection at the time of operation. In fact, the presence of chest signs and symptoms is an indication for the employment of this method of anaesthesia, provided the surgical condition permits. There were no other ill after-effects whatever.

In four cases only there was apparent failure to produce anaesthesia. Two of these in the earlier part of the series were undoubtedly due to the fact that the needle had made a valve-like opening in the dura which permitted the cerebrospinal fluid to escape, and when the percaïne was injected it went extradurally.

In the other two cases, which were dealt with during extremely cold weather, anaesthesia came on one to two hours after the operation had been completed in one case under general and in the other under local anaesthesia.

When percaïne fails, or when the anaesthesia is not sufficiently high (as found in some operations in the upper abdomen), the question of what form of anaesthetic to give as an alternative is not yet decided. Perhaps local anaesthesia with novocain by itself or with the aid of light open chloroform and ether mixture is the best. As the premedication does not include atropin, the administration of unaided ether mixtures to the required stage of anaesthesia may be difficult. There is also a risk of post-anaesthetic pulmonary infection. In the event of percaïne anaesthesia being delayed, it may be found that this has supervened during the course of the operation which has been continued under a general anaesthetic. In any case, it is better to defer operation in such cases for at least half an hour to allow the fullest time for percaïne to take effect. In the meantime, another case can be dealt with. When it is found that the percaïne anaesthesia has not reached a sufficiently high level, as sometimes happens in dealing with the stomach, gall-bladder, etc., light general anaesthesia by ether and chloroform mixture has been found very safe and efficient.

At times the skin incision must be extended upwards, and while the intra-abdominal organs are quite insensible to pain it may be found that the upper end of the skin wound is quite sensitive. In these cases novocain locally injected meets the difficulty.

Great care must be exercised to determine the difference between (a) Anaesthesia proper; (b) persistence of sense of passive movement; (c) power of active movement.

Active movement of the lower limbs may persist long after the required degree of anaesthesia has been produced, even as high as the tenth
intercostal region. The sense of passive movement, which the patient
describes as "pushing and pulling," may persist throughout.

The following is the method of administration now employed:

1. The systolic blood-pressure is recorded.
2. Pre-medication. A hypodermic injection of alopon $\frac{1}{3}$ grain and
scopolamine $\frac{1}{30}$ grain is given three-quarters of an hour before spinal
puncture. The patient is left at rest and quiet for this time, and
although the drowsiness and sleep normally found to supervene after the
anaesthetic is effective do not show earlier, this rest period has a very
good effect on the general condition of the patient both during and after
the operation.

3. The systolic blood-pressure is recorded immediately before spinal
puncture. This is compared with the clinical signs of intradural pressure
of cerebrospinal fluid as shown by the rate of flow when the needle is
introduced.

4. After a hypodermic injection of half a cubic centimetre of 2 per
cent novocain spinal puncture is made at the chosen level with the patient
lying on the side opposite to that on which the site of operation is to be
performed. For operations in the upper abdomen the first and second
lumbar space has been found quite satisfactory. The best site for opera-
tions in the lower abdomen is the second and third lumbar space. For
operations on the rectum and lower limbs the third and fourth lumbar
space is found most convenient.

5. The cerebrospinal fluid is allowed to escape until the flow is a
slow drip (one per second). If there is any tinge of blood when the drip
has reached this rate, it is better to withdraw the needle and puncture in
the space next above. The needle is turned once or twice during this
preliminary flow of fluid to ensure that it is actually within the dura.

6. Percaine which has been previously heated to $37^\circ$ C. is then
injected. The quantity has been roughly estimated according to the
height of the patient.

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<th>Height</th>
<th>Quantity</th>
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<tr>
<td>5 feet to 5 feet 4 inches</td>
<td>14 cubic centimetres</td>
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<tr>
<td>5 feet to 6 inches</td>
<td>16 &quot;</td>
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<td>6 &quot; to 7 &quot;</td>
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<td>7 &quot; to 8 &quot;</td>
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When cases show undue excitement or are of a nervous or neurotic
tendency, an extra cubic centimetre is added to the above table.

7. Ephedrine 1 cubic centimetre is injected hypodermically imme-
diately the spinal needle is withdrawn.

8. The patient is then turned on his face, care being taken to keep
the head not higher than horizontal with the spine.

9. Systolic blood-pressure is recorded five minutes after the spinal
injection is completed.

It is found that satisfactory anaesthesia is produced in seven to ten
minutes after spinal injection.
The warming of the percaine has been introduced with the idea of combating shock and in the belief that the action is quicker and more diffuse than with a cold solution.

Ephedrine to sustain the blood-pressure is a doubtful aid—from the records of blood-pressures in the last twenty-five cases the fall in blood-pressure has been pretty constant, and in a few cases alarmingly great. When the fall exceeds 36 millimetres, the patient becomes very cyanosed and respiration is very shallow and slow. The pulse-rate has not been found to be affected in any marked degree nor have any ill after-effects been observed.

The table of blood-pressures, although from only a few cases dealt with by me this year, is recorded for what it is worth. The greatest fall in blood-pressure from normal after spinal injection was 50 millimetres in two cases. Several instances of falls of 42-48 millimetres were recorded. The minimum fall was 12 millimetres; the average was 33·2 millimetres.

The variation from normal up to the end of premedication was not constant. In roughly one-third of the cases there was a rise, in others a slight fall; the average fall was 12·1 millimetres; the average difference was 4·9 millimetres. The marked fall is from the end of premedication to the completion of the spinal injection of percaine; the greatest fall recorded being 62 millimetres and the least 4 millimetres, with an average of 28·3 millimetres. As there were no instances of "spinal headache"
since these pressures were recorded methodically no inferences could be drawn, except that the greater or smaller the fall did not seem to bear any direct relation to the causation of headache.

In all cases the urine is tested as a routine measure the day before operation. The injections of ephedrine are continued at eight hours, twenty-four hours, and thirty-six hours after operation.

Headache may be due to the blood-pressure remaining abnormally low for twenty-four hours after operation.

The vexed question of when to allow the head to be raised still remains to be answered; it has been my custom to allow patients to sit up as soon as the effects of the anaesthesia have completely disappeared, after six to eight hours, normally.

The most important points which have been noted and the improvements in the technique which have been made during the period covered by this note are:

1. Pre-operative quiet for three-quarters of an hour to promote a feeling of ease, mental rest and confidence.
2. Drainage of cerebrospinal fluid until the intradural pressure is somewhat below normal, before the injection of the comparatively large quantity of percaine.
3. Warming of the percaine solution.
4. Absence of risk of headache if the patient's head is raised after effects of anaesthesia have completely disappeared.
5. The methodical recording of blood-pressures at the three stages. This will be carried out throughout the year in the hope that some evidence may be obtained as to the relation of blood-pressure to the incidence of headache.

To sum up, this method of promoting anaesthesia has shown no serious drawback or risk.

There have been no ill-effects other than a few transient headaches. The complete relaxation found when performing abdominal operations very greatly assists in the ease with which these operations are effected, and greatly reduces the time expended on them.

The patient experiences no distress from vomiting and coughing, which are such common troubles after the administration of a general anaesthetic even when given with the greatest skill and care.

The fact that he can have a hot drink of tea and smoke a cigarette as soon as he returns to bed has a very consoling and comforting effect both on him and other candidates for surgical interference waiting in the wards.

Lastly, the surgeon has complete confidence that once anaesthesia is effected, there will be no contretemps or delays arising from the anaesthetic.

I believe that where surgical conditions permit and when the services of a really experienced anaesthetist are not available, this form of anesthesia is much preferable to any form of general anaesthesia or other forms of spinal anaesthesia of which I have had experience.