SPINAL ANAESTHESIA: A RE-EVALUATION*

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EACH SURGICAL PATIENT presents a different problem and the anaesthetist in choosing his method must decide:

1. What is safe?
2. What will have a minimum of side effects?
3. What will give the surgeon the best working conditions and facilitate the surgery?
4. Do the disadvantages of the method outweigh the advantages?

Much has been written regarding spinal anaesthesia and there is still much disagreement as to its rightful place in our practice. The possibility of neurological complications has been the greatest deterrent to its use.

Spinal anaesthesia provides complete anaesthesia, maximum relaxation, and a minimum disturbance of metabolism.

How safe is the method? C. R. Stephen (1) has stated: "Spinal anaesthesia may be considered as safe as any method of pain relief, provided meticulous care is observed, common sense is exercised, and the technique is reserved for patients who want it, surgeons who desire it, and anaesthetists who can perform it intelligently." Also, R. R. MacIntosh (2) writes: "Spinal anaesthesia is no more and no less dangerous than general."

Recently Dripps and Van Dam (3) reported their follow-up on 10,098 spinal anaesthetics and their failure to discover major neurological sequelae; Bittrich's (4) series of 6,000 spinal anaesthetics in obstetrics without any major complications is evidence that the incidence of neurological tragedies can be minimized.

In 1950, Foster Kennedy (5) published his report on major neurological complications following spinal anaesthesia. Six of the eleven patients he saw had received continuous spinal anaesthesia.

Meningitis has followed the use of syringes sterilized by lying in an alcohol solution and arachnoiditis resulted from the use of ampules sterilized in a phenol solution. Cauda Equina syndromes have followed the use of nupercaine 1:200 used for saddle block. These are all developments that could have been avoided.

Spinal anaesthesia requires strict adherence to proper techniques:

1. The patient should be visited before surgery and cardio-vascular and respiratory status should be evaluated. Do not urge this technique if he objects. Note blood pressure, haemoglobin, and R.B.C. Older patients who have lost weight or have carcinoma may have a low blood volume. Blood should be given before surgery. Is pain out of proportion to the disease? Is there a history of previous neurological disease such as poliomyelitis, syphilis, or meningitis? If there is, avoid spinal anaesthesia.

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2. The patient should be comfortable on the table and care should be used in moving him or changing his position on the table. Sacroiliac joints have been strained and the patient will believe it is all due to the spinal puncture.

3. Everything used should be autoclaved. We place the ampules to be used for a spinal anaesthetic in a large test-tube and autoclave at 20 lb. for 5 minutes. We have not noticed any deterioration in potency.

4. Only the minimum amount of drug necessary for anaesthesia should be used and never in high concentration.

5. Needles, should be used which will cause the least injury to the dura. Avoid multiple punctures.

6. The method should be stopped if the patient complains of persistent pain, either in back or radiating down the leg.

7. Careful watch should be kept for any embarrassment of circulation or respiration.

8. Equipment should be at hand to meet any emergency.

9. The patient should be kept well hydrated, give fluids intravenously on the table and encourage him to drink afterwards or see that he gets 3000 cc. intravenously, daily.

10. The patient should be horizontal for 6 to 8 hours after operation but he should move from side to side as soon as anaesthesia has worn off. This will help to avoid backaches.

We are reporting our experience with 1,255 consecutive cases. These represent about 17 per cent of our surgical boardings. Ages range from 16 years to 86 years. Eleven per cent were for surgery of the upper abdomen—gastric resections, cholecystectomies, perforated ulcers, hemicolectomies, 49 per cent lower abdomen—hernias, appendectomies, prostatectomies, abdominal perineal resections, and Caesarean sections, 40 per cent ano-rectal surgery and surgery of the extremities—amputations, arthrotomies, hip prosthesis, vein strippings.

Premedication for the average case has been pentobarbital, gr. $1\frac{1}{2}$ at bedtime and two hours prior to surgery, and morphine sulphate gr. $\frac{1}{4}$ or Demerol 100 mg with Atropine gr. $1/150$ one hour before surgery.

Pontocaine has been the anaesthetic of choice in all cases. The 1 per cent solution was used in combination with $1\frac{1}{2}$ to 2 times its volume of 10 per cent Dextrose. If more than $1\frac{1}{2}$ hours of anaesthesia were required, $\frac{1}{4}$ cc. Epinephrine 1:1000 was added.

Patients who were operated on in the lateral position were given pontocaine diluted to 10 cc. with warm distilled water. The table was kept in reverse Trendelenburg till anaesthesia was sufficiently high and then turned to Trendelenburg.

If the Trendelenburg position were required for a long anaesthetic, Pontocaine solution with 0.25 cc. Epinephrine and 0.75 cc. Dextrose 10 per cent was placed in a 5 cc. syringe and sufficient cerebrospinal fluid withdrawn to make 5 cc. It was then barbotaged by injecting 2 cc. and withdrawing 1 cc. and repeating until the syringe was emptied. This gives anaesthesia to dorsal 6 or 7 and the anaesthesia does not shift with change of position of the patient.

Dosage

Upper abdomen: 10-15 mg. If Epinephrine is added, usually 10-12 mg. which give 3 hours of anaesthesia.

Lower abdomen: 7-12 mg. Here 12 mg. with Epinephrine will give 4 hours for abdominal perineal resections.

Ano-rectal: 4-5 mg. will give 1½ hours of anaesthesia.

Extremities. 8-10 mg. with Epinephrine will give 4 hours of anaesthesia for bilateral vein stripping.

Technique of Puncture

Nearly all have been done in the lateral position. A well-premedicated patient, if asked to sit up, may feel faint and become nauseated.

The patient's back was sterilized with tincture of mercresin and the site of the puncture injected with a mixture of 25 to 50 mg. of Ephedrine and 2 cc. of 1 per cent procaine to provide local anaesthesia. Should the patient complain of persistent pain when the spinal needle is introduced the method should be abandoned. This has not happened in our series.

We used a long bevel 1½" 18G needle as a guide. It was passed through the ligamentum flavum, usually between L 3/4. A 22G spinal needle can be passed through this without being deflected and if one does not enter the spinal canal on the first try, the spinal needle only is withdrawn a short distance and the direction changed by moving the guide needle. This avoids multiple punctures of the ligamentum flavum, a contributing cause to backache.

Much has been written regarding the relationship of puncture of the dura to headache. We have used various types of spinal needles with the following results.

In 23 cases using the Tuohy catheter technique employing a 16G spinal needle, there were two headaches—one being severe, lasting two to three weeks.

Prior to this series, we had used 26G needles in a number of cases. No patient had a headache, but the technique was more difficult and there was a wait of 30 to 60 seconds before spinal fluid was seen. Movement of the patient during this wait might break a fine needle.

Haraldson and Whitacre had both reported the use of a pencil-point needle which had a hole on the side. With this they experienced a considerable reduction in the percentage of headaches. We postponed using this type of needle until a 22G size was available. The pencil-point is welded to the shaft of the needle and apparently presents manufacturing difficulties as Becton, Dickens & Co. have discontinued making this item.

Using this needle 896 times, there have been six patients who complained of headaches—3 hemorrhoidectomies, 2 herniorrhaphies, and one incision and drainage of an abdominal-wall abscess. Two of these were patients who had become dehydrated. One of them was immediately cured with 1,000 cc. of 5 per cent Dextrose in distilled water, intravenously. Two were relieved with Empirin Compound tablets. Only one headache was moderately severe; in this case there had been difficulty in doing the spinal tap and two spaces had been

punctured. All these patients had recovered within seven days. This group includes 27 Caesarean sections; none of these patients experienced a headache.

A 22G needle, with the usual bevel, was used in 227 cases. There were no headaches in the abdominal cases, but 3 in 89 patients who were operated on for hernias and hemorrhoids.

A 24G needle was used 49 times and two headaches are recorded.

Since the 22G pencil-point needle is no longer available, we have recently been using a 22G Green needle. This needle is sharpened in 3 quadrants. We have used it 38 times without a headache being reported.

We tried to see all our cases on three successive days following surgery. All patients were asked if they had any complaints and if they had been out of bed (nearly all patients are up within 24 hours of surgery). We did not ask directly "Do you have a headache?" We feel that if the patient has been up and has a spinal headache, he will tell you about it. The floor nurses were asked to report any complaints to them of headache and they have been co-operative.

Besides the type of needle, hydration has been an important factor. All patients, other than those with saddle blocks, received 1,000 cc. 5 per cent Dextrose in distilled water, intravenously. This was started immediately after completion of the anaesthetic. In case of a severe drop in pressure, Ephedrine in 10 mg. doses can be injected into the tubing. Oxygen 100 per cent is also given by mask at the same time. Drops in pressure have not caused so much alarm since the advent of hypotension and total spinal techniques.

Anaesthesia, sufficiently high to cause apnoea, occurred twice. The table was placed in slight reverse Trendelenburg and artificial respiration undertaken with a gas machine, using the "educated hand." In neither case was there an unusual fall in blood pressure and normal respirations were established within 30 minutes. Meanwhile, surgery progressed without the surgeon being aware of the situation.

Nearly all patients wish to be asleep during surgery. Most were given 100 to 200 mg. of Sodium Nembutal as soon as a satisfactory height of anaesthesia had been established. Small doses of Pentothal Sodium, rarely exceeding 400 mg., were added subsequently. In all upper abdominal cases, and many others, there was also a supplement with a 50-50 mixture of nitrous oxide and oxygen. Respirations must be watched carefully and assisted if there is any evidence of hypoxia or hypercardia. The majority of patients were awake before leaving the operating room.

On returning to their rooms, patients are allowed a pillow but they remain in an horizontal position for 6 to 8 hours. However, they are asked to turn in bed as soon as the anaesthetic wears off, and urged to take fluids freely, if there is no contraindication.

Backaches have not been a problem. On the table the patient's head is raised on a pillow and, if the back is not touching the table, padding is placed under the spine. Care should be taken in handling the patient as the sacroiliac joints can easily be strained. Some patients have noticed a tenderness over the site of the puncture when getting a back-rub.

There was one case of foot drop following a continuous spinal anaesthetic with the catheter technique. This completely cleared in 8 weeks. We no longer

employ continuous spinal techniques since the addition of Epinephrine gives sufficient time for nearly all cases.

A considerable number of herniorrhaphies and hemorrhoidectomies required catheterization once or twice, but this was also the case when general anaesthesia was used.

SUMMARY

Spinal anaesthesia provides complete anaesthesia, maximum relaxation, and a minimum disturbance of metabolism. There is still much disagreement as to its rightful place in our practice; the possibility of neurological complications has been the greatest deterrent to its use.

Spinal anaesthesia requires strict adherence to proper technique. Such technique may be summarized as follows:

1. Choose the patient intelligently.
2. Asepsis is mandatory.
3. Avoid traumatizing the patient.
4. Use needles which will cause the least injury to the dura.
5. Keep the patient well hydrated and comfortable.

Experience with 1,255 consecutive cases of spinal anaesthesia is reported.

RÉSUMÉ

La rachianesthésie donne une anesthésie complète, un relâchement maximum et ne dérange qu'au minimum le métabolisme. Il existe encore beaucoup de controverse sur le rôle qu'elle doit jouer dans notre pratique, la possibilité de séquelles neurologiques étant le plus fort argument contre son emploi.

La rachianesthésie commande la plus rigoureuse technique. Cette technique peut se résumer ainsi:

1. Choisir les malades de façon intelligente.
2. Suivre une technique des plus aseptiques.
3. Éviter tout traumatisme chez le malade.
4. Ne pas employer d'aiguilles susceptibles de blesser les méninges.
5. Maintenir une bonne hydratation chez le malade et voir à son confort.

Nous faisons part de notre expérience sur 1,255 cas consécutifs de rachianesthésie.

REFERENCES

1. STEPHEN, C. R. How Safe is Spinal Anaesthesia in Present Day Practice? *Can. Anaesth. Soc. J.*, 2: 67-74 (1954).
2. MACINTOSH, R. R. Aspects of Spinal Anaesthesia. *Indian J. Surg.*, 15: 157-61 (1953).
3. DRIPPS, R. D. & VAN DAM, L. D. Long-term Follow-up of Patients who received 10098 Spinal Anaesthetics. Failure to Discover Major Neurological Sequelae. *J.A.M.A.*, 156: 1486-91 (1954).
4. BITTRICH, N. M. & RANGATORE, J. S. Spinal Anesthesia in Obstetrics. *Am. J. Obst. & Gynec.*, 62: 1314-20 (1951).
5. KENNEDY, F., EFFRON, A. S. & PERRY, G. Grave Spinal Paralysis caused by Spinal Anesthesia. *Surg., Gynec. & Obst.*, 91: 385-98 (1950).