SOME SUGGESTIONS FOR THE CONDUCT OF CONTINUOUS SPINAL ANAESTHESIA

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LEMMON (1) first introduced continuous spinal anaesthesia in 1940. Since that time it would appear that it has not gained the popularity that would seem to have been its due. This is largely because of the difficulty of its administration. As a consequence of this many anaesthetists and surgeons, having found ordinary spinal anaesthesia of not sufficient duration, have reverted to endotracheal ether or some combination of less potent anaesthetics with curare. Dripps and Deming (2) have shown that pulmonary complications are more common after general anaesthesia than after spinal anaesthesia unless rigid prophylactic measures are observed preceding, during and following operation. Levy and Conroy (3) have published some tests which tend to show that ether anaesthesia, by greatly shortening the prothrombin time, encourages the production of thrombosis and postoperative embolism. There is no doubt that continuous spinal anaesthesia for long operations is to be preferred to an ordinary spinal anaesthesia in which the operation has to be completed by a relatively deep ether anaesthesia. On the other hand, a well conducted continuous spinal anaesthesia produces less apprehension preoperatively and increases the operability rate in malignant disease, with a minimum of trauma and of complications during convalescence.

It is not my intention to discuss different methods of anaesthesia or to comment upon them in this paper. I merely wish to report a series of cases in which continuous spinal anaesthesia has been employed, the technique of which, although unorthodox, has proved so successful that at the present time I have no inclination to change to any other method.

In the early experiences with continuous spinal anaesthesia it was difficult to introduce the blunt soft needle and to maintain the required anaesthesia with the intermittent additions of procaine. These efforts with continuous spinal anaesthesia seemed doomed to failure.

At that time nupercaine had been used for more than ten years with very excellent results. It was therefore, concluded that if the results with the prescribed form of continuous spinal anaesthesia with procaine were not completely successful, nupercaine might be used for the first dose. Then if the second dose of procaine were not success-
ful, possibly owing to some displacement of the needle, the anaesthetist would be no worse off than if nupercaine had been used in the customary way.

It was decided to do this. The first anaesthesia, using a preliminary dose of nupercaine followed by a second dose of procaine was induced on July 15, 1941. Since that time, except on rare occasions, I have used no other method. This method has given completely satisfactory anaesthesia in over 95 per cent of cases.

The operations for which this method was used were those in which it was considered that a single dose of nupercaine might not produce anaesthesia for the duration of the operative time. The series presented consisted of 354 cases, as follows: gastrectomies, 218; exploration and repair of common bile duct, 31; colon resections, 62; laparotomies, 19; removal of pancreas, 8; abdominal and umbilical hernias, 16. With a few exceptions these operations were all performed at the Toronto General Hospital.

It is my firm belief that all patients upon whom major abdominal surgical procedures are being performed under spinal anaesthesia should have no cognizance of their surroundings. It is my habit to visit all patients the night previous to operation, and at the time of this essential preanaesthetic visit to tell them that they will remember little or nothing of leaving their room or of having their spinal anaesthetic and that they will be asleep before they leave the anaesthesia room. At this visit the anaesthetist becomes acquainted with the patient. The blood pressure is taken and the heart and lungs examined. Any history of previous illnesses, operations or anaesthesics is inquired into. An endeavour is made to reassure the patient to the greatest possible degree. In order to have the patient in the desired state of somnolent cooperation it is necessary to administer a fairly heavy sedative. At this hospital we have administered the same sedative for spinal anaesthesias for over fifteen years and have found it completely satisfactory. The night previous to the operation almost any patient may be given 1½ grains of pentobarbital sodium. If the patient is a man of ordinary build and not in the old-age group, one and one half hours before the scheduled time of the operation, he is given morphine, ¼ grain and hyoscine ½₉₀ grain. One hour before the scheduled time of operation 3 grains of pentobarbital sodium orally and three-quarters of an hour before operation morphine, ½ grain and hyoscine, ½₉₀ grain are given. If the patient is a woman in the same age and build group, the dosage given is as follows: one and one half hours before operation, morphine, ¼ grain and hyoscine, ½₉₀ grain; one hour before operation pentobarbital sodium, 1½ grains, and three-quarters of an hour before operation morphine, ½ grain and hyoscine, ½₉₀ grain. The doses are lessened or some are omitted for patients who are not of the average build and age group, or for those who give a history of any idiosyncrasy to the drugs to be
used, which history should always be ascertained. The dosage to be
given must be determined by the anaesthetist at his preanaesthetic
visit, and the need for this decision is possibly one of the most im-
portant reasons for the visit to the patient the night before operation.
As a result of this preoperative sedation, the patient is brought to the
operating room in a state of composure and somnolence. In most
cases the patients are quite drowsy but can answer questions and fol-
low any directions given to them.

The patient is moved as gently as possible from the carriage to the
operating table which is covered with the special continuous spinal
anaesthetic mattress; he is placed on the left side so that his back is in
the correct position over the window in the mattress. A large pillow is

![Image](http://anesthesiology.pubs.asahq.org/pdfaccess.ashx?url=/data/journals/jasa/931718/ on 06/20/2017)

**Fig. 1.** Patient being held in position while knees are being drawn up.
placed under the head, the knees are drawn up slightly and the hips and shoulders adjusted to rest as nearly as possible at the edge of the mattress. The right arm upon which the blood pressure cuff is applied, should rest on the pillow in front of the patient’s face. This will help to keep the back in a vertical position. The patient is given 3/4 grain of ephedrine or preferably 20 mg. of methedrine. Methedrine was suggested by Dripps and Deming (4) in 1946. I have used it since that time and have found it superior to ephedrine in maintaining the blood pressure level. The back is painted with iodine which is allowed to dry and is then removed so far as possible with alcohol. A spinal anaesthetic sheet, containing a window through which to work, is laid over the patient. The anaesthetist then places his gloved left hand on

![Continuous spinal in place in canal through punch.](image)

the patient’s right shoulder, and his right hand on the patient’s right iliac crest and requests the patient to draw his knees as near to his chin as possible (fig. 1). No endeavour is made to bend the head upon the chest. In this way the anaesthetist can control the position of the patient on the table. If the patient is too drowsy to respond satisfactorily, the assisting nurse is usually able to place the knees in the correct position. The desired interspace (usually the second or third lumbar for upper abdominal operations or the third or fourth lumbar for lower abdominal procedures) is palpated by the index finger of the right hand, the anaesthetist having his left hand on the iliac crest. The desired interspace is thoroughly infiltrated with 0.5 per cent pro-
caine solution. A punch, capable of allowing the 20 gauge needle to pass through it, and not over 1½ inches in length including the flange, is introduced through the skin in the presumed direction the needle is to take. From this stage on the technique is somewhat different from the prescribed methods for administering continuous spinal anaesthesia. A hard, sharp 20 gauge needle is passed through the punch. In a large percentage of cases the needle enters the spinal canal. If it does not do so, it is withdrawn to some extent and, the punch still in position, is shifted somewhat so that it points in a slightly different direction and the sharp needle is again introduced. Using this procedure the needle usually enters the canal with little difficulty. In using

![Fig. 3. Punch having been withdrawn as far as needle will allow to prevent breakage of punch.](image)

this method a 10 cc. Luer-Lok syringe, containing about 2.2 cc. of a 10 per cent procaine solution, is ready for the second injection. This syringe is attached to the needle which is in the spinal canal and fluid withdrawn to a volume of 12 cc. After this is done, the punch is carefully grasped with the left hand, supporting the hand against the patient’s back, and the hard, sharp needle is carefully withdrawn, taking every care not to disturb the position of the punch. The soft, dull continuous spinal needle is passed through the punch, following the same direction that was taken by the sharp needle. Invariably the soft needle enters the spinal canal without difficulty (fig. 2).

The requisite dose of 1 in 1,500 nupercaine solution (from 16 to 18 cc. depending on the patient’s height) is slowly introduced through the
soft needle. The syringe is disconnected, the needle capped, and the punch carefully withdrawn as far as the head of the needle will allow (fig. 3). The patient is then carefully turned face down for from eight to ten minutes. At the expiration of this time anaesthesia is tested by pinching the patient with a forceps to determine whether the area of anaesthesia is sufficiently high for the contemplated operation. Care must be taken in turning the patient to the prone position. It can usually be done best by two persons, the anaesthetist and an efficient orderly. The patient, who is lying on his face, is first gently rolled to the left side. The anaesthetist then lifts the shoulders and the orderly the hips to the far side of the table, being careful to move at the same time. The patient is allowed to roll gently onto his back, again care being taken that the spine does not twist during the rolling. The continuous spinal tubing which has been attached to the 10 cc. Luer-Lok syringe containing the solution of procaine and spinal fluid is filled, leaving 10 cc. in the syringe. The cap is carefully removed from the spinal needle projecting downward from the patient's back, and the continuous tubing locked on. It is essential before locking on the continuous spinal tubing to rotate the lock and tubing slightly to the left, as the lock may otherwise become loosened by the torsion of the tubing. There was one failure because of this in our earlier anaesthetics. The patient is now ready to go to the operating room except for one thing. On the preanaesthetic visit he had been assured that he would be asleep before he entered the operating room. Accordingly, while he is still in the anaesthetic room, an intravenous drip of 5 per cent glucose in saline solution is started. At the Toronto General Hospital where this series of cases was done there is a most efficient blood bank and intravenous service in charge of three graduate nurses who have had special training in intravenous technique. When intravenous fluid or transfusion is required they are notified and their speed and efficiency is one of the bright spots of the hospital service. While the intravenous is being started a 2.5 per cent solution of sodium pentothal is prepared by the anaesthetist. Some of this solution is drawn into a 10 cc. Luer-Lok syringe to which is attached an ordinary continuous spinal tubing with the stopcock at the syringe end and a small bore hypodermic needle attached to the other end. The tubing is filled with the pentothal solution and the needle inserted into the intravenous tubing quite close to the needle entering the vein. The continuous spinal tubing is sufficiently long to allow the syringe to rest within easy reach of the anaesthetist beside the patient's head (fig. 4). The 2.5 per cent pentothal solution is slowly introduced into the intravenous tubing at the rate of about 1 cc. a minute until the patient is asleep. The table and patient are then rolled into the operating room.

In the operating room the mask connected with a Heidbrink gas machine is strapped on the patient's face and a mixture of about 30
per cent oxygen and 70 per cent nitrous oxide is allowed to flow through the machine at the rate of about 4 litres a minute. This procedure is followed for three reasons. The first is that it supplies an adequate amount of oxygen which can be increased at a moment's notice if required. Through the cooperation of Prof. J. K. W. Ferguson of the Department of Pharmacology the anaesthetists have been able to follow the oxygen saturation of the blood by means of an oxymeter and this has shown that with the above percentage of oxygen the blood remains saturated at all times, consistent with the saturation the blood would

![Fig. 4. Continuous spinal and pentothal syringes ready for use.](image)

have if air were being breathed. The second reason is that such a mixture gives some degree of analgesia which may be of assistance, for example, in upper abdominal traction. Finally, if for some reason deeper anaesthesia is required, the machine is in readiness and cyclopropane or ether may be added without commotion or delay.

The operation having commenced, the patient is given 1 cc. of pentothal every five minutes. If he stays quietly asleep, as is the custom, this time interval may be gradually increased to ten or fifteen minutes between additions. It has been found from experience that if more than 1 cc. is required every five minutes to keep the patient asleep and
quiet, it is better to discard the pentothal and to use cyclopropane, as patients requiring a greater dose of pentothal are likely to be restless and disturbed for some considerable time following the operation.

The second spinal injection of procaine is usually not given until the anaesthetist judges that the surgeon needs about ten minutes more before the peritoneum is to be sutured. The length of time an operative procedure on the intestine may be carried out with the initial dose of nupercaine is often surprising but, generally speaking, if over one and a half hours have elapsed since the injection of the nupercaine, the placing of forceps on the peritoneum with resultant traction will cause the muscles of the abdomen to become tense, with resultant increased intraperitoneal pressure and bulging of the intestine, making closure difficult if not impossible.

In this series the freedom from postoperative complications has been quite gratifying. It is the custom at this hospital to elevate the foot of the bed about 4 inches for approximately twenty-four hours after operation. We consider that this measure, combined with the intravenous drip, has much to do with the low incidence of headaches even when a 20 gauge needle is used. The incidence of mild headaches is somewhat under 4 per cent. They are usually controlled readily with codeine and phenobarbital. More severe headaches which are disabling occurred in approximately 1.5 per cent of the series. Considerable relief has been afforded for this type of headache by an intravenous injection of 50 mg. of "naotin" which has been used by Goldzieher and Popkin (5), with great success for headaches following spinal taps. It was found that when the patients were permitted out of bed the day of operation the incidence of mild headaches increased to approximately 10 per cent. The patients were relieved of headaches by lying down. When the patients were not permitted out of bed until the second day, the incidence of headaches dropped to approximately 4 per cent. It was necessary to catheterize approximately 80 per cent of the patients. This percentage dropped very sharply when the patients were out of bed on the second day.

In conclusion, it may be said that with the described type of anaesthesia the surgeon may perform his most difficult operations with ease and a minimum of postoperative complications and the patient, freed from the fears of the operating room, goes to sleep quietly and tranquilly and awakens to the realization that his feared ordeal is over and that he is on the road to recovery.

REFERENCES


(Continued from page 187)

LUNCHEON

Presiding: Edward B. Tuohy, M.D.

1:00 P.M. Observations on the Use of a New Drug (PT-19) in Spinal Anesthesia.

Seymour Schotz, M.D., Philadelphia, Penna.

1:40 P.M. The Effects of Epinephrine and Ephedrine Intrathecally on Cardiac Rhythm during Cyclopropane Anesthesia.

John Adriani, M.D. and John Howard, M.D.

2:00 P.M. Recess to visit exhibits.

2:40 P.M. The Effect of "Penicillin-Inhibitors" on the Urinary Excretion of Barbital.

Edward B. Tuohy, M.D., and Arnold Thames, M.D., Washington, D. C.

3:20 P.M. Group Practice in Anesthesia.

Howard M. Ausherman, M.D., Chattanooga, Tenn.

6:30 P.M. COCKTAILS.

7:00 P.M. BANQUET.

Presiding: H. Boyd Stewart, M.D.

Speaker: H. H. Clegg, Assistant Director Federal Bureau of Investigation—"The Doctor and the Confidence Man."

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